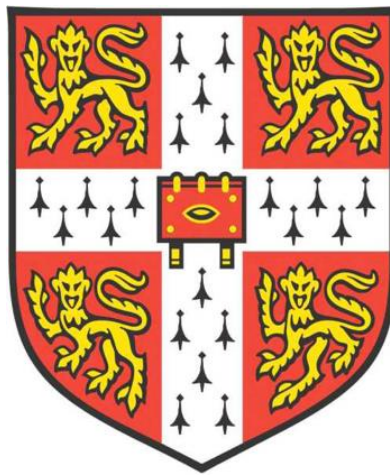


Economic Diversification and Development in Resource-dependent Economies: Lessons from Chile and Malaysia



Abdelkader Amir Lebdioui

St Catharine's College

Centre of Development Studies

University of Cambridge

August 2019

This dissertation is submitted for the degree of Doctor of Philosophy

This thesis is dedicated to the memory of Giulio Regeni.

Declaration

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text.

It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my dissertation has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text

It does not exceed the prescribed word limit for the relevant Degree Committee.

A.A. Lebdioui

Cambridge

23rd August 2019

Summary

Economic Diversification and Development in Resource-dependent Economies: Lessons from Chile and Malaysia

Abdelkader Amir Lebdioui

This thesis investigates the role of the state in promoting economic diversification in countries that are over-reliant on the extraction of non-renewable resources. The objective of this thesis is particularly timely given the current context of commodity price bust, which has revealed the economic vulnerability of several commodity-dependent countries. Economic diversification has consequently been brought back as a policy priority in such countries. However, various resource-dependent countries have attempted to diversify their economies but have failed to do so throughout history. As such, this study addresses the question of what needs to be done to diversify such economies, by focusing on the role of industrial policy. The ambition is that this thesis and its theoretical foundations can enrich our understanding of the underlying causes of export diversification and structural change in resource-dependent countries.

The first contribution of this thesis is to reframe theoretical debates related to natural resources and economic development by elaborating a taxonomy of diversification strategies and by reconceiving the way we measure extractive resource endowment through the elaboration of a multidimensional indicator. Three main diversification pathways are discussed in this thesis, namely financial diversification, vertical diversification, and horizontal diversification. This study also demonstrates the contextual determinants that influence the urgency to follow diversification strategies over others.

The second part of this thesis has adopted the analytical account of specific historical cases as the main heuristic for disentangling dynamics of economic diversification in natural resource-dependent economies. It compares the experiences of Chile and Malaysia in diversifying their economies since the 1950s in order to contribute to existing discussions on viable policy interventions for economic development and diversification. This research also contributes to reframing existing narratives on the development of Chile and Malaysia by challenging several misconceptions associated with both countries, notably regarding the role of free market forces.

This thesis finds that the role of industrial policy goes beyond *facilitating* diversification, as it also *shapes* the direction of such diversification. In both case studies, government interventions that successfully promoted new sectors not only fixed market failures but also shaped the accumulation of productive capabilities, both within and beyond commodity value chains. It is therefore found that neoclassical and path-dependent approaches to diversification are not suitable in explaining the process of structural change of resource-dependent economies, in contrast to more dynamic approaches to comparative advantage and capabilities accumulation.

Table of contents

Chapter 1: Introduction

1.1	Objectives and purpose of this thesis	18
1.2	The subject of economic diversification and natural resource abundance.....	19
1.3	Methodology	23
1.3.1	Comparative research method	23
1.3.2	Quantitative comparative analysis.....	25
1.3.3	Qualitative comparative analysis: case studies.....	26
1.3.4	Data sources and analysis.....	31
1.4	Summary of chapters.....	33

Part I: Conceptual framework

Chapter 2. Critical literature review

2.1	Overview	36
2.2	Correlation between natural resources and economic development	37
2.2.1	The ‘Resource Curse’ literature.....	37
2.2.2	Resource optimism	42
2.2.3	Concluding remarks.....	43
2.3	Linkages arising out of natural resource sectors: towards a taxonomy of diversification paths	44
2.3.1	Vertical Diversification	46
2.3.2	Horizontal Diversification	50
2.3.3	Financial Diversification	53
2.4	What type of government intervention is necessary for diversification?.....	55
2.4.1	Overview	55
2.4.2	Vertical Diversification	56
2.4.3	Horizontal diversification.....	60
2.4.4	Managing fiscal revenues from resource extraction.....	66
2.5	Concluding remarks	69

Chapter 3. Towards a new approach to measuring resource abundance

3.1	Introduction	70
3.2	Defining and measuring resource abundance.....	70
3.2.1	Defining and classifying natural resources.....	70
3.2.2	Defining abundance and dependence	72
3.3	Resource abundance comes in several shapes: introducing the MINDEX	75
3.3.1	Overview	75
3.3.2	Seven different scenarios.....	77
3.3.3	Methodology.....	80
3.3.4	Results	85
3.4	Implications for development strategies and next steps.....	90

Chapter 4. Managing resource revenues in the context of diversification: bringing back a holistic developmental approach

4.1. Introduction.....	92
4.2 Options for managing resource revenues.....	93
4.2.1 Mapping out different options to managing resource revenues	93
4.2.2 Holistic approach to resource revenue management and underlying trade-offs	100
4.3 Five reasons why the domestic investment of resource revenues should be prioritized in some countries.....	102
4.3.1 Breaking the pattern of low investment rates that characterizes developing economies	102
4.3.2 Sustainable and gradual increase in private consumption	104
4.3.3 The importance of export diversification for growth and employment according to the degree of resource abundance per capita.....	106
4.3.4 Institutional measures can mitigate the political risks associated with domestic investments of resource revenues	114
4.3.5 A Developmental Approach Towards Investing Resource Revenues.....	118
4.4 Conclusion.....	125

Part II: Comparative study

Chapter 5. Resource revenue management in Chile and Malaysia

5.1 Introduction	127
5.2 Petroleum revenues management in Malaysia	127
5.2.1 Overview	127
5.2.2 Composition and fiscal importance of resource revenues	128
5.2.3 How resource revenues are spent	130
5.2.4 Impact on the local economy.....	135
5.3 Copper revenues management in Chile.....	136
5.3.1 Overview	136
5.3.2 Fiscal linkages towards innovation and R&D?	139
5.3.3 A case of fiscal stabilization at the expense of structural transformation	141
5.4 Conclusion.....	143

Chapter 6. Chile's vertical integration in the copper sector

6.1 Introduction	145
6.2 Forward production linkages in Chile's copper sector: to smelt or not to smelt?. 146	
6.2.1 Overview	146
6.2.2 Underlying factors explaining Chile's limited smelting and value addition.	148
6.2.3 Short-term profit maximisation and ownership considerations.....	149
6.2.4 The influence of global commodity prices on value addition decisions.	150
6.2.5 China's copper ore demand restrains Chile's leverage in terms of domestic value addition.....	151
6.2.6 Increasing demand by diversifying markets and applications of copper?.....	151
6.3 Backward production linkages.....	152
6.3.1 Assessment of Chile's mining supply industry: strengths and limitations.....	152
6.3.2 Barriers to backward linkage development	154
6.3.3 Recent interventions	161
6.4 Conclusion.....	164

Chapter 7: Malaysia's vertical integration in resource sectors

7.1	Overview	165
7.2	Petroleum sector: Malaysianization of the petroleum value chain	169
7.2.1	Overview of accumulation of upstream capabilities	169
7.2.2	Policy tools to Build Local Capabilities in the upstream Sector	170
7.2.3	Overview of the accumulation of downstream capabilities	178
7.2.4	Policy tools to Build Local Capabilities in the Downstream Sector	180
7.3	Palm oil	183
7.3.1	Overview	183
7.3.2	Historical evolution: emergence, ownership and value addition.....	186
7.3.3	Role of industrial policies.....	188
7.3.4	Conclusion.....	193
7.4	Rubber-based manufacturing	194
7.4.1	Overview	194
7.4.2	Historical evolution	195
7.4.3	Industrial Policies to promote rubber-based manufacturing	198
7.5	Findings.....	202
7.5.1	Scope for diversification through resource-based industries.....	202
7.5.2	Role of the State for sending market signals towards value addition.....	202
7.5.3	Role of the state to support learning by doing and capabilities accumulation	203
7.5.4	Price incentives.....	204
7.5	Conclusion.....	205

Chapter 8: Chile's horizontal diversification: a free market *miracle* or *mirage*?

8.1	Overview	206
8.2	Sector analysis.....	209
8.2.1	The Salmon industry.....	209
8.2.2	The fruit sector	216
8.2.3	Wine sector.....	222
8.2.4	The Forestry industry	224
8.3	Policy evaluation using a difference-in-difference method	228
8.3.1	Fruits and vegetables	229
8.3.2	Salmonids and other fish exports	230
8.4	Findings.....	231
8.4.1	Role of the state as catalyst of human capital accumulation	231
8.4.2	Role of the state as venture capitalist	232
8.4.3	Role of the state for Trade promotion	233
8.4.4	The quality control role of the state to ensure 'national' reputation	233
8.4.5	Correlation between export diversification and industrial policy	234
8.5	Concluding remarks	238

Chapter 9: Malaysia's horizontal diversification: a tale of two sectors

9.1	Overview	241
9.2	the electronics and electrical sector.....	243
9.2.1	Overview and performance of the sector.....	243
9.2.2	How did the E&E sector emerge in Malaysia? Market or state promotion?.....	245
9.2.3	Industrial strategy for the E&E sector after 1986.....	248
9.2.4	Conclusion	256
9.3	The automotive sector	257
9.3.1	Overview	257
9.3.2	Role of the State	260
9.3.3	Assessment: why Malaysia did not do better in the automotive sector?	268
9.4	Conclusion: a tale of two sectors.....	271

Chapter 10: Findings and concluding remarks

10.1	Overview	273
10.2	Contribution to theoretical debates on the role of industrial policy in the diversification process	274
10.2.1	One thing does not lead to another	275
10.2.2	Diversification policy implications: The role of the state beyond fixing market failures.....	276
10.2.3	The influence of domestic ownership on linkage development	286
10.2.4	Policy environment, historical legacies and institutional norms.	288
10.3	Reframing the narrative of economic development of Chile and Malaysia.....	294
10.3.1	Malaysia: industrial policy and resource-based industries as engines of growth.....	294
10.3.2	Chile: the free market myth.....	296
10.3.3	Comparing the performance of both countries	298
10.4	Limitations and future areas of research	299
10.4.1	Environmental concerns	299
10.4.2	Redistributional effects of different diversification pathways	300
10.4.3	The multidimensional indicator of extractives-based development (MINDEX)	301
10.5	Concluding remarks	302

Bibliography	304
--------------------	-----

Appendix A: Scoring Criteria Underlying the MINDEX.....	354
---	-----

Appendix B: Historical Phases of Industrial Policy in Malaysia.....	358
---	-----

Appendix C: Categorization of some of Chile's Policy Interventions	359
--	-----

Appendix D: Data of the difference-in-difference method in chapter 9	360
--	-----

Appendix E: Palm oil exports in Malaysia after 1994.....	361
--	-----

List of figures

FIGURE 1. EVOLUTION OF THE COMPOSITION OF EXPORTS OF SELECTED RESOURCE RICH ECONOMIES	29
FIGURE 2: MAPPING OUT DIVERSIFICATION PATHS ARISING OUT OF COMMODITIES.....	46
FIGURE 3: WEIGHTING DIFFERENT INDICATORS OF RESOURCE ABUNDANCE/DEPENDENCE	75
FIGURE 4: SEVEN SHAPES OF “RESOURCE ABUNDANCE”	78
FIGURE 5: APPLICATION OF THE MINDEX TO SELECTED COUNTRIES (YEAR 2010).....	85
FIGURE 6: LONGITUDINAL ANALYSIS THROUGH THE MINDEX FOR SELECTED COUNTRIES	88
FIGURE 7: IMPLICATIONS OF THE MINDEX FOR DIVERSIFICATION STRATEGIES IN SELECTED CASES	91
FIGURE 8: THE MAIN OPTIONS FOR MANAGING RESOURCE REVENUES.....	94
FIGURE 9: VARIOUS OBJECTIVES OF RESOURCE REVENUE MANAGEMENT AND THEIR INTERCONNECTIONS	101
FIGURE 10: EXPORT DIVERSIFICATION AND UNEMPLOYMENT RATES (2010)	107
FIGURE 11: CHANGES IN GDP PER CAPITA AND DIVERSIFICATION RATES IN TIMES OF HIGH COMMODITY PRICES (2000-2010)	108
FIGURE 12: CHANGES IN GDP PER CAPITA AND DIVERSIFICATION RATES IN TIMES OF LOW COMMODITY PRICES (1990-2000)	108
FIGURE 13: CHANGES IN EMPLOYMENT AND DIVERSIFICATION RATES IN TIMES OF HIGH COMMODITY PRICES (2000-2010)	109
FIGURE 14: CHANGES IN EMPLOYMENT AND DIVERSIFICATION RATES IN TIMES OF LOW COMMODITY PRICES (1990- 2000)	109
FIGURE 15: MANUFACTURED EXPORTS AS A SHARE OF MERCHANDISE EXPORTS IN 2009	113
FIGURE 16: MANUFACTURING EXPORTS IN TOTAL EXPORTS IN RESOURCE-RICH COUNTRIES IN 2012	114
FIGURE 17: OIL AND MINERAL RENTS AS SHARE OF GDP IN MALAYSIA AND CHILE (1993-2016)	129
FIGURE 18: SHARE OF OIL REVENUES AS A PERCENTAGE OF EXPENDITURES.....	131
FIGURE 19. COMPOSITION OF FISCAL REVENUES IN CHILE.....	136
FIGURE 20: FISCAL REVENUES FROM STATE COPPER COMPANIES AND REVENUE ALLOCATION TO THE SCIENCE, TECHNOLOGY AND INNOVATION PROGRAMMES (1990-2010, USD MILLION)	140
FIGURE 21: GENERAL GOVERNMENT NET DEBT AS SHARE OF GDP IN CHILE (1991-2018).....	142
FIGURE 22: EVOLUTION OF THE VALUE OF REFINED COPPER AS A SHARE OF TOTAL COPPER EXPORTS IN CHILE (PERCENTAGE).....	147
FIGURE 23: COMPOSITION OF MALAYSIA’S EXPORT BASKET IN 2017	166
FIGURE 24: MALAYSIA’S TRADE BALANCE BY SECTOR (1988-2017).....	166
FIGURE 25: STAGES OF VALUE ADDITION IN THREE COMMODITY SECTORS IN MALAYSIA	167
FIGURE 26: SHARE OF PETRONAS’ REVENUES BY AREA OF ACTIVITY IN 2012	179
FIGURE 27: MALAYSIA’S PALM OIL EXPORTS BETWEEN 1960 AND 1994	184
FIGURE 28: BREAKDOWN OF PALM OIL PRODUCTS EXPORTED IN 2011	184
FIGURE 29: COMPOSITION OF CHILE’S EXPORT BASKET IN 2017	206
FIGURE 30: DIAGRAM OF SOME OF THE KEY POLICY INTERVENTIONS BEHIND THE EMERGENCE OF CHILE’S NON-MINING SECTORS.	208
FIGURE 31: EXPORT VOLUME OF THE SALMON INDUSTRIES BY COUNTRY (IN THOUSAND TONS).....	209
FIGURE 32: EVOLUTION OF CHILEAN EXPORTS OF FRUITS AND VEGETABLES BETWEEN 1964 AND 1999	229
FIGURE 33: EVOLUTION OF CHILE’S EXPORTS OF SALMON PRODUCTS AND OTHER FISHERY EXPORTS USING THE DiD METHOD (IN USD MILLION).....	230
FIGURE 34: EVOLUTION OF EXPORT DIVERSIFICATION IN CHILE AND MALAYSIA (1964-2010)	236
FIGURE 35: EVOLUTION OF MANUFACTURING VALUE ADDED AS SHARE OF GDP IN SELECTED DEVELOPING COUNTRIES.....	242
FIGURE 36: EXPORT, IMPORTS AND TRADE BALANCE OF MALAYSIA’S E&E SECTOR	243
FIGURE 37: SHARE OF FOREIGN VALUE-ADDED IN E&E EXPORTS ACROSS SELECTED COUNTRIES	244
FIGURE 38: CONTRIBUTION OF THE E&E SECTOR TO MANUFACTURING EXPORTS AND MANUFACTURING VALUE ADDED IN MALAYSIA	244
FIGURE 39: EXPORTS AND IMPORTS OF AUTOMOTIVE PRODUCTS IN MALAYSIA 1990-2016.	259
FIGURE 40: SALES, IMPORTS AND EXPORTS OF MALAYSIAN VEHICLE COMPONENTS AND PARTS.....	259
FIGURE 41: SHARE OF FOREIGN VALUE-ADDED IN AUTOMOTIVE EXPORTS IN SELECTED COUNTRIES	260

List of Tables

TABLE 1: COMPARING FRAMEWORKS OF THE RESOURCE REVENUE MANAGEMENT POLICY CHAIN	76
TABLE 2: SEVEN CASE SCENARIOS.....	77
TABLE 3: UNDERLYING SCORING CRITERIA OF THE MINDEX	81
TABLE 4: SELECTED COMMODITY PRICES	82
TABLE 5: POTENTIAL REVENUE FOREGONE FROM PETRONAS' CONTRIBUTIONS TOWARDS GAS SUBSIDIES ...	133
TABLE 6. THE ECONOMIC AND SOCIAL STABILIZATION FUND (ESSF)'S INVESTMENT POLICY.....	138
TABLE 7: INDICATORS COMPARING MINING SUPPLIERS IN CHILE AND AUSTRALIA IN 2012.....	153
TABLE 8: EXPORTS OF SUPPLIERS IN CHILE'S COPPER SECTOR BY SIZE OF EXPORTS IN 2014.....	153
TABLE 9: OVERVIEW OF SOME OF DIFFERENT VERTICAL POLICY TOOLS USED TO PROMOTE LOCAL CONTENT IN MALAYSIA'S PETROLEUM SECTOR.....	170
TABLE 10: SELECTED INDICATORS OF THE MALAYSIAN PETROCHEMICAL INDUSTRY IN 2014.	180
TABLE 11: SOURCES OF CONTRIBUTION TO THE DEVELOPMENT OF TECHNOLOGIES FOR PROCESSING, FISH DISEASE CONTROL AND FEED PRODUCTION	211
TABLE 12: RESEARCH IN THE SALMON SECTOR THAT WAS FINANCED BY GOVERNMENT FUNDING BETWEEN 1987 AND 2008.....	214

List of abbreviations

AfDB	African Development Bank
AFTA	ASEAN Free Trade Agreement
BIT	Bilateral Trade Agreement
CBU	Completely Built Units
CIA	Central Intelligence Agency
CKD	Completely Knocked Down
CNID	National Council for Innovation and Development of Chile
COCHILCO	National Commission for Mining and Development of Chile
CONICYT	National Commission for Scientific and Technological Research
CORFO	Production Development Corporation of Chile
CPO	Crude Palm Oil
E&E	Electronics and Electrical
ECC	European Common Market
ECLAC	Economic Commission for Latin America and the Caribbean
EEV	Energy Efficient Vehicles
EITI	Extractive Industries Transparency Initiative
EOI	Export-Oriented Industrialisation
EPU	Economic Planning Unit
EPZ	Export Processing Zones
ESSF	Economic and Social Stability Fund
ETP	Economic Transformation Programme
EU	European Union
FCh	Fundación Chile
FDI	Foreign Direct Investment
FELDA	Federal Land Development Authority
FIP	Fisheries Research Fund
FTA	Free Trade Agreement
FTZ	Free Trade Zone
GATS	General Agreement on Trade in Services
GCC	Global Commodity Chain
GDP	Gross Domestic Product
GLC	Government-Linked Company
GNI	Gross National Income
GVC	Global Value Chain
HDI	Human Development Index
HICOM	Heavy Industry Corporation of Malaysia
HRDF	Human Resource Development Fund
IBRD	International Bank for Reconstruction and Development
ICF	Innovation for Competitiveness Fund
IFOP	Fisheries Development Institute
IMF	International Monetary Fund
IMP	Industrial Master Plan

INFOR	Forestry institute of Chile
INIA	Institute of Agriculture Research
INSTEP	Institut Teknologi Petroleum of Petronas
INTESAL	Salmon Technology Institute
IRPA	Intensification of Research In Priority Areas
ISI	Import-Substitution Industrialisation
ITC	International Trade Centre
JFA	Japanese Fisheries Association
KWAN	Kumpulan Wang Amanah Negara [<i>National Trust Fund</i>]
LCP	Local Content Policy
MAA	Malaysia Automotive association
MAI	Malaysian Automotive Institute
MARDI	Malaysian Agricultural Research and Development Institute
MATRADE	Malaysia External Trade Development Corporation
MENA	Middle East and North Africa
MIDA	Malaysia Industrial Development Authority
MIGHT	Malaysian Industry-Government Group for High Technology
MIMOS	Malaysian Institute of Microelectronics Systems
MINDEX	Multidimensional Indicator of Extractives-Based Development
MITI	Ministry of Trade and Industry
MNE	Multinational Enterprise
MOSTA	Malaysia Oil Scientists and Technologists Association
MPIC	Malaysia's Ministry of Plantation Industries and Commodities
MPOA	Malaysia Palm oil association
MPOB	Malaysian Palm Oil Board
MPOC	Malaysian Palm Oil Council
MPRC	Malaysia Petroleum Resources Corporation
MRB	Malaysia Rubber Board
MREPC	Malaysian Rubber Export Promotion Council
MSC	Multimedia Super Corridor
MTDC	Malaysian Technology Development Corporation
MVA	Manufacturing Value Added
NAFTA	North American Free Trade Agreement
NAP	National Automotive Policy
NEP	New Economic Policy
NRGI	Natural Resource Governance Index
ODM	Original Design Manufacturer
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OFSE	Oil Fields Services and Equipment
PCG	Petronas Chemicals Group Berhad
PDA	Petroleum Development Act
PEMANDU	Performance Management and Delivery Unit
PIA	Promotion of Investment Act
PIH	Permanent Income Hypothesis
PNB	Permodalan Nasional Berhad

POCPA	Malaysia's palm oil credit and payment arrangement
PORAM	Palm Oil Refiners Association Malaysia
PORIM	Palm Oil Research Institute of Malaysia
PORLA	Palm Oil Registration and Licensing Authority
PPO	Processed Palm Oil
PRF	Pension Reserve Fund
PSC	Production Sharing Agreements
PSDC	Penang Skills Development Centre
SAG	Servicio Agrícola Ganadero [<i>Agricultural and Livestock Service</i>]
SERNAP	National Fisheries Service
SLF	Sovereign Liquidation Fund
SME	Small and Medium-Sized Enterprise
SOE	State-Owned Enterprise
STIC	Standard International Trade Classification
SWF	Sovereign Wealth Fund
TARRC	Tun Abdul Razak Research Centre
TIPs	Treaties with Investment Provisions
TRIMs	Agreement on Trade-Related Investment Measures
UNCOMTRADE	United Nations International Trade Statistics Database
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UPM	Universiti Putra Malaysia
USAID	United States Agency for International Development
UTP	Universiti Teknologi Petronas
VDP	Vendor Development Programme
WTO	World Trade Organization

Acknowledgements

I cannot thank enough the many people who have supported me in this doctoral research, which has been an extremely enriching experience.

The dissertation was completed under the supervision of Dr Ha-Joon Chang, to whom I owe an immense debt of gratitude. His intellectual guidance, support, and meticulous comments have shaped this doctoral work as well as the way I approach research more broadly. I'm thankful to him for always encouraging me to think outside the box, to keep an inquisitive mind and to defy the conventional wisdoms. Having him as a mentor has been an eye opening and enriching experience.

Special thanks also goes to the two examiners of this thesis, Professor Tony Addison and Dr Pedro Loureiro, for their intellectually stimulating feedback and thoughtful remarks.

I am also grateful to faculty members for the stimulating discussions at the Centre's weekly seminars. In particular, this dissertation has benefited from valuable feedback by Prof. Peter Nolan, Dr Gay Meeks, Dr Maha Abdelrahman, Dr Shailaja Fennell, Dr Tadashi Hirai, Dr Helena Perez Nino, Michael Kuczynski and Tan Sri Azman Mokhtar.

I also thank my family for their constant and unconditional support. My father Salah, my mother Fatima, my sisters Amina and Rima, have been an unmatched source of inspiration, motivation and encouragement. I am also thankful to my late grandfather, Hocine Namous, for always encouraging me to study further.

Special thanks also go to Marcela Morales for her intellectual and emotional support throughout this thesis, and for her companionship during my various fieldwork trips across the world.

This work would have been made much more difficult without my colleagues and friends in Cambridge who have brightened my doctoral days. I am thankful to Josh, Laura, and Isabel for intellectually stimulating breakfast conversations that influenced parts of this thesis. I am thankful to my friends from the Centre of Development Studies (listed alphabetically): Anne, Anna, Aline, Andres, Chris (whose footsteps I seem to systematically follow), Clement, Epifania, Halima, Ivan, Jaime, Jose-Miguel, Joao, Jostein, Kiryl, Lorena, Matthew, Nicolas, Nafisa, Noura, Paola, Sam, Shama, Taskeen, Vasiliki, and others. Gratitude also goes to the insightful researchers I have met from the

Institute for Manufacturing (Carlos, David, and Michele). I am also grateful to my friends in London (particularly Rachouane, Saleha, Matthieu, Stefan, Nik, Marina and Catarina, who have hosted me, cheered me up, and even lent me their office space when needed).

I am also thankful to Chris Hope, Kiryl Zach, Alfie Ulloa, Mustafa Metin, Georges Quist, Mateus Labrunie, Clement de Rivas, Rekha Bhangaonkar, Reda Cherif, Fuad Hasanov, Carlo Pietrobelli, Keun Lee and Kangkook Lee, for reading parts of my thesis and offering extremely constructive feedback.

I am also grateful to all the government officials, scholars, business executives and civil society representatives who have offered their insights during fieldwork trips in Algeria, Chile, Malaysia and Ecuador. In particular, for their help during my fieldwork, I would like to thank: Manuel Agosin, Mabrouk Aib, Ali Aissaoui, Nordine Ait Laoussine, Hasan Akram, Ahmed Benbitour, Claudio Bravo-Ortega, Datuk Chander, Steven Cheng, Pamela Chavez, Prof. Ffrench Davis, Daniel Goya, Prof. Jomo, Prof. Jorge Katz, Nik Khaw, Claudio Maggi, Mustapha Mekideche, Patricio Meller, Tan Sri Azman Mokhtar, Slim Othmani, Eric Parrado, Rajah Rasiah, Issad Rebrab, Gonzalo Rivas, Andres Solimano, Prof. Thillainathan, Alfie Ulloa, Osvaldo Urzua, and Dato Wong.

The fieldwork for this thesis has also benefited from financial support awarded by St Catharine's College and the Department of Politics and International Studies. This doctoral work has also benefited from supplementary funding from the Cambridge Political Economy Society Trust.

Lastly, I dedicate this doctoral thesis to the late Giulio Regeni, whose devotion to research as a collective endeavour remains a source of inspiration to all of us.

Chapter 1: Introduction

1.1 OBJECTIVES AND PURPOSE OF THIS THESIS

The purpose of this thesis is to examine, analyze and explain the process of export diversification of natural resource-dependent economies. The objective of this thesis is particularly timely given the current context of commodity price bust since late 2014, which revealed the economic vulnerability of countries that over-rely on commodities for exports and foreign exchange generation. Many resource-dependent economies that had been enjoying high growth rates over the previous decade suffered shocks, became starved of foreign currency, which led some of them (such as Venezuela) to even experience a humanitarian crisis (Lahn and Stevens, 2018). Against this backdrop, export diversification has naturally been brought back as a policy priority in many resource rich countries.

Nevertheless, a key question that remains is how to diversify resource-dependent economies. Throughout history, various resource-dependent countries have attempted to diversify their economies but have failed to do so. UNCTAD (2019) shows that over half of all countries, and two thirds of developing countries, are still commodity-dependent.¹ In addition, 63 out of the 72 most extractive-dependent countries have increased their dependence on extractives in the past 15 years (Roe and Dodd, 2018).

In that context, this study attempts to answer the question of what needs to be done to diversify resource-dependent economies by examining the role of the state in promoting sustainable economic diversification. However, this study aims to go beyond the provision of a descriptive and analytical overview of country experiences in diversifying their economy. Instead, the ambition is that this thesis and its theoretical foundations can enrich our understanding of the underlying causes of export diversification and economic development in natural resource rich countries more broadly. In particular, this doctoral

¹ UNCTAD considers a country to be commodity-dependent when commodities represent more than 60% of its total merchandise exports in value terms.

² The heterogeneity of results in econometric studies is partly due to the variety of methods and

work aims to contribute to debates surrounding the role of industrial policy and market forces in the promotion of structural change.

The first part of this thesis aims to rethink and reframe the theoretical debates related to natural resources and economic development as well as reconceive the way we measure resource endowment by developing a multidimensional method to measure resource abundance and dependence.

The second part of this thesis examines what type of policies are required to promote the accumulation of capabilities in new competitive industries, value addition along commodity value chains, and to maximize the developmental impact of resource revenues. More specifically, this thesis does so by comparing and contrasting the experiences of Malaysia and Chile in diversifying their economies. In presenting these cases, this study hopes to contribute to existing discussions on viable public policy interventions for economic diversification and resource-based development. Nevertheless, this thesis does not seek to define a single recipe for ‘success’. Instead it moves away from the tendency to prescribe a one-size-fits-all solution in order to offer a comprehensive account of the contextual determinants and mechanisms required to harness extractive resources for sustainable development.

1.2 THE SUBJECT OF ECONOMIC DIVERSIFICATION AND NATURAL RESOURCE ABUNDANCE

What do we already know about this subject and how does this research contribute to the existing literature?

The literature on the relationship between natural resources and economic development dates back to at least the 14th century. Indeed, long before the ‘modern’ resource curse thesis (see seminal works such as Auty, 1994; Gelb et al., 1988; Ross, 1999; Sachs and Warner, 1995, 1997, 2001), cognitive explanations for the resource curse, based on the idea that resource booms or ‘easy wealth’ produce a type of shortsighted euphoria among

policymakers, were already introduced by Ibn Khaldun in the 14th century and Jean Bodin in 16th century (Bodin, 1576; Ibn Khaldun, 1967 [1377]).

Theoretical debates on the role of natural resource abundance and development have been marked by both resource optimism and pessimism, with one or the other being in the ascendant at any particular time, but neither being dominant across time (Lahn and Stevens, 2018). In the past three decades, a plethora of econometric and statistical studies aimed to contribute to this debate by attempting to find a correlation between natural resource abundance and economic development. Some have found a positive correlation (e.g. Bravo-Ortega and De Gregorio, 2007; Brunnschweiler, 2008; Davis, 1995; Findlay and Lundahl, 1999; Pineda and Rodriguez, 2010); some have found a negative one (e.g. Gylfason, Herbertsson, and Zoega, 1999; Neumayer, 2004; Mehlum, Moene, and Torvik, 2006; Sachs and Warner, 1995, 1997), while others did not find any clear-cut statistical correlation (e.g. Bond and Fajgenbaum, 2014; James, 2015).

In light of the mixed evidence, and the inability of econometric studies to determine a clear correlation between resource abundance and growth,² there has been a growing awareness that natural resources are neither a curse nor blessing, but rather that their contribution to development depends on what states make of them. If there is nothing inherently inevitable that predetermine natural resources as a curse for development, we must move beyond resource determinism and instead attempt to understand the ways in which natural resources can be harnessed for development. While the recent literature has moved towards a recognition of state policy action in making the most of commodities (see Addison and Roe, 2018; Arezki, Sy and Gylfason, 2012; Chang, 2007b; Collier, 2003; Humphreys, Sachs and Stiglitz, 2007; Lederman and Maloney, 2007), there are still important disagreements regarding the optimal nature and scope of state interventions. This research contributes to this debate by analyzing dynamics of state intervention in the management of resource sectors towards achieving structural transformation.

² The heterogeneity of results in econometric studies is partly due to the variety of methods and statistical misconceptions when measuring resource abundance, as further explained in chapter 3.

The issue of productive economic transformation has mostly been neglected by the recent literature on the role of natural resource in development. In other words, development has disappeared from the development discourse in relation to the debate on natural resources too (Chang, 2010). Indeed, over the past decade, a large body of literature has focused on showing that the effect of natural resources on economic development depends on the quality of governance and institutions (Mehlum, Moene, and Torvik, 2006), degree of maturity of democracies (Caselli and Tesei, 2016), openness to international trade (Arezki and van der Ploeg, 2008), human capital (Bravo-Ortega and de Gregorio, 2007), or the presence of developed financial systems (van der Ploeg and Poelhekke, 2008). However, one element that has not systematically been addressed is the role of different diversification strategies in shaping the economic growth outcomes in resource-rich countries. This thesis is consequently geared towards bringing back the issue of economic diversification at the analytical core of the resource-based development discourse.³

Focusing on economic diversification is justified for several reasons. Diversification enables a country to reduce its exposure to commodity price volatility. Beyond such concern, diversification may have an even more important to play as a part of economic development. Diversification can be understood not as goal in itself, but a means to leap into the frontline of the development race (Benavente, 2016). Some scholars have indeed argued that countries get richer not by producing more of the same but by learning how to produce a more diverse range of technologically dynamic and sophisticated goods and services (Chang, 2007a, 2007b; Hausmann, Hwang and Rodrik, 2007). Chapter 4 of this thesis contributes to this view by showing that, beyond macroeconomic stability, export diversification also matters for long-term income growth and employment generation in medium resource rich per capita countries. Nevertheless, while this research is premised on the notion that export diversification is a broad objective that most resource rich

³ Naturally, the design and implementation of diversification policies do not take place in a vacuum and rely on the quality of infrastructure governance and human capital available. However, what is the direction of the causality? For instance, “does low human capital lead to specialization in natural resource exports, or does specialization in natural resources lead to reduced investments in human capital? Causality can run both ways” (Gelb and Grasmann, 2009:94).

countries should pursue, it appreciates that not all resource rich economies have similar needs for diversification.⁴

Several empirical studies have evidenced that export diversification is an engine of structural change and economic growth (Agosin 2009; Cadot et al 2013; Cherif et al., 2018; Gozgor and Can 2017; Grossman and Helpman, 1993; Hausmann et al 2007; Mau, 2016). However, other empirical studies have also reported contradicting results regarding the correlation between diversification and economic development. Imbs and Wacziarg (2003) and Cadot et al (2011) find evidence of an ‘inverted-U’ relationship where trade diversification rises up to a certain level of development and then declines. According to Klinger and Lederman (2004), in developing countries, the removal of market failures that limit the ‘cost-discovery’ process leads to higher diversification, while in contrast, as countries develop, the removal of less profitable activities and the specialization in goods and services where the comparative advantage is stronger leads to re-specialization.

Here, two points can be made. Firstly, the case of resource-rich countries might be particular and requires careful attention. Some of the econometric studies might be influenced by the effect of commodity prices. High commodity prices may lead to faster growth in resource-dependent countries, which in turn may wrongly give the impression that export diversification is negatively correlated with growth, if the period covered is that of a commodity boom (chapter 4 evidences that the effect of diversification on growth in resource rich countries differs according to commodity prices).

Secondly, in contrast to the literature above, a different theory could be elaborated regarding the relationship between export specialization and growth as one that follows a “U shape”. According to my hypothesis, and as further explained in chapter 3, in order to grow, low-income countries that have large mineral endowment should first specialize in

⁴ The multidimensional indicator of extractives-based development developed in chapter 3 contributes to identify which countries face the most urgency to diversify. Chapter 4 also puts forward the contextual determinants that influence the urgency to follow certain diversification pathways over others as a development strategy.

commodity extraction in order to appropriate resource revenues to stimulate initial capital accumulation, before using such revenues to invest in facilitating export diversification.⁵ Economic development can thus be perceived as the process of structural transformation to diversify economies away from dependence on primary products. In that perspective, focusing on the experience of extractive-dependent economies, this thesis raises two essential questions:

- 1) What are the different diversification routes that arise out of commodities?
- 2) What is the role of the state in promoting different diversification pathways?

My main hypothesis is that the economic development and export diversification of resource-dependent countries cannot be optimally managed through market forces alone. This thesis consequently draws on different theoretical approaches to the role of the state in industrial development to explain why certain resource rich countries have succeeded to develop whilst others have not.

1.3 METHODOLOGY

1.3.1 Comparative research method

Comparative research methods have long been used to identify and explain similarities and differences across societies. Comparative research also enables the researcher to put a greater emphasis on contextualization of different national settings. A study is held to be cross-national and comparative when a particular issue is examined in two or more countries using the same research instruments, in order to explain similarities and differences (Hantrais, 1995). Such approach enables to make generalizations or to gain a deeper understanding of reality in different national contexts.

There are several approaches to conduct comparative research. Broadly speaking, we can differentiate inductive from deductive approaches. Deductive approaches are aimed at

⁵ Whether such relationship is followed by a process of re-specialization (leading to an ‘inverted-N’ shape) appears to be debatable. In any case, export diversification appears to be a strong determinant of development for resource rich developing countries.

testing theory and hypothesis regarding a particular subject of study by collecting and analyzing empirical data. This ultimately enables one to confirm (or refute) original theories. Inductive approaches work in reverse by moving from specific observations to broader generalizations and theories in order to generate new theory emerging from the data. This thesis can mostly be considered as grounded in deductive reasoning, as it attempts to test the importance of the role of industrial policy over market forces alone in helping the export diversification process in resource rich countries. However, the borders between the two approaches are porous because most social research (including this project) involves both inductive and deductive reasoning at different points of the research due the continuous cycle from theories to observations and back.

This thesis relies on mixed methods because different parts of the thesis call for different methodological tools according to what is more appropriate to inform the particular subject of study and research sub-questions. In Part I, chapters 3 and 4 mostly relies on quantitative comparative methods, while Part II relies on case studies through an qualitative approach in order to dig deeper into the contextual determinants that inform our subject of study. The country-case comparative study is conducted both at the cross-national level and through within-nation comparisons (through cross-sector comparisons).

However, it is worth noting that the different methods in this thesis are intrinsically related. The use of quantitative data across large datasets in Part I enables us to develop country classifications based on observed patterns, which in turn serves as the basis for identifying suitable and comparable countries for further qualitative study. The use of case studies and longitudinal analysis enables us to further examine whether shared phenomena (such as export diversification) can be explained by the same causes.

1.3.2 Quantitative comparative analysis

The methodologies used in chapter 3 and 4 are mostly based on the analysis of quantitative datasets, and fall outside the broader comparative study between the cases of Malaysia and Chile.

Chapter 3 is concerned with rethinking the methodology to measure resource abundance and resource dependence. As a result, a new method and tool is suggested: the multidimensional indicator for extractives-based development (MINDEX). This method relies on a multidimensional measurement that includes six different indicators of resource abundance and dependence (resource exports, resource rents, government resource revenues, share of resource revenues in total government revenue, and share of resource exports in total exports). The methodological choices for scoring countries according to each of these criteria and data sources are further explained within chapter 3.

Chapter 4 features quantitative comparative methods. In particular, cross-country and panel data analyses are used to compare a set of countries in order to test the correlation between three variables: export diversification, resource abundance per capita (measured in resource rents and resource export per capita) with a third variable (such as unemployment, poverty and inequality rates).⁶

In chapter 9, a quantitative policy evaluation is conducted using a difference-in-difference method. The use of difference-in-difference estimations has been widespread in the study of the impact of policies on a certain outcome in a natural experiment using observational and longitudinal data (Angrist and Pischke, 2008). I have looked at the effect of sector specific policies on different sectors by using exports value as the outcome variable. While several factors can impact a sector's level of exports, including sector neutral policies that might have been implemented at the same time as the ones I am evaluating, I have reduced the level of bias by choosing control groups that are sub-sectors within the same sector but that did not benefit from vertical interventions to the

⁶ Regression techniques were used to further test the correlation but their inclusion in the current version of the thesis was not deemed necessary. Further methodological issues such as data reliability and comparability are further discussed inside chapter 4.

same extent as the treated group, in order to plot a trend before and after the intervention (t_0). I did not conduct such policy evaluation method systematically across the thesis for one main reason that relates to the difficulty of conducting policy evaluations in contexts where the effect of individual programmes and policies cannot be singled out because different types of interventions have also been running simultaneously. In the case of Chile, reasonable assumptions could be made to build counterfactuals given the context in which different sub-sectors within the same sector were not equally targeted by vertical policies.

1.3.3 Qualitative comparative analysis: Case studies

1.1.1.1 Why case studies?

Part II of this thesis answers the research questions by comparing a set of two comparably endowed resource rich countries (Chile and Malaysia) that experienced similar yet somehow different outcomes in terms of export diversification.

Methodologically sound and detailed case studies can be useful in informing the subject of study. However, case studies also have their limitations. Particularly, they may only help us compare specific policies in a specific setting, which may render generalizations more difficult. The use of only two country cases in my study means that this thesis is limited to only two developmental experiences. Case studies may also be subject to selection biases, as authors may select cases that confirm their priors. As a result, some researchers find cross-national econometric studies more relevant, but we can argue that the sole reliance on such methods suffer from considerable flaws. Firstly, as shown in chapter 2 and 3, existing econometric studies have been unable to find consistent results. In contrast, we can learn a lot more about the design and the implementation of policies, as well as their consequences and feasibility through careful case studies. Only then should quantitative policy evaluation methods be used to support or test qualitative observations. Second, quantitative datasets available across countries are not always comparable, and the solutions to such problems involve an understanding of different national contexts and circumstances.

The limitations of case studies can be balanced out by their benefits. While this thesis only addresses two case studies, it appears that giving advantage to depth is more sensible because it enables to do two main things: firstly, it enables us to cover a wide range of issues related to export diversification, resource-based development and resource revenue management (such as the role of the policy environment, how consumption and social redistribution has been sustained, the impact of diversification on inequality and poverty rates and vice versa, etc.). Case studies approach also enables us to consider differences in social and cultural settings, which may not be captured through quantitative data and econometric studies alone. Secondly, such approach enables within-country comparisons to grasp a better understanding of each country's developmental experience, including both its internal successes and failures. Consequently, the comparative study will be able to draw an accurate general picture of issues and policy-mechanisms underlying resource-based development and economic diversification in the context of resource-dependent economies.

1.1.1.2 The selection of Malaysia and Chile as case studies

The choice and mix of countries selected in comparative studies affects the quality and comparability of the data. In order to avoid selection biases consisting in the selection of cases that confirm priors, it is important to define clear guidelines and criteria for picking case studies. In this thesis, the choice of Malaysia and Chile is motivated by several reasons, most of which related to similarities across key variables, which relate to their nature and degree of resource endowment, on the one hand, and their degree and type of export diversification, on the other hand.

First of all, both Malaysia and Chile are endowed with extractive resources.⁷ Malaysia is a significant petroleum producer while Chile is the largest producer of copper globally. One methodological issue may lie in the comparability between the mining sector and the petroleum sector. It can be argued that mining and petroleum (particularly offshore),

⁷ Interestingly, both countries also dispose of a diversified agriculture resource endowment. In that sense, an interesting observation (and point of comparison) is that both Malaysia's and Chile's diversified primary commodity sector is not merely 'natural' but was in large parts the result of public policies in promoting and diversifying towards primary commodities.

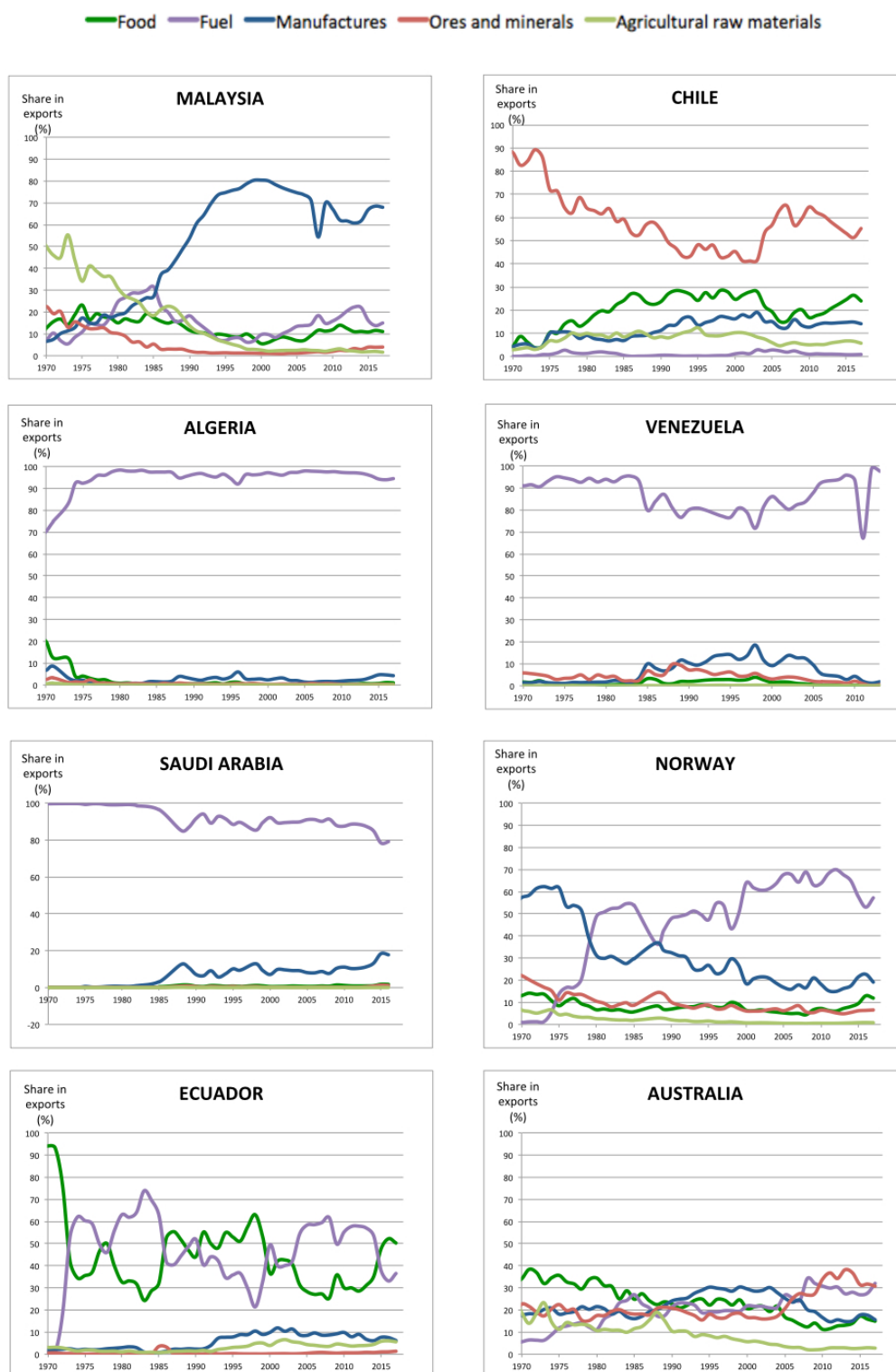
feature some differences that may impact the development of linkages for instance. The assumption of this thesis is that such differences do not invalidate this study because mining and petroleum have much more in common than what distinguishes them. Hard commodities (such as metals) generally involve complex technologies, large-scale and capital-intensive production and intensive use of infrastructure (such as road and rail links, which may be used by other sectors). Energy commodities have similar characteristics to hard commodities, apart from the fact that the infrastructure they involve may have fewer externalities to other sectors, especially in the context of offshore extraction (Morris et al. 2012).

Second, both Chile and Malaysia are what I have termed ‘medium resource-rich per capita’ countries. The classification of resource abundance developed in chapter 4 is particularly important as it sheds light on the necessity of comparing countries with similar levels of resource endowment (measured in terms of mineral resource exports/rents/reserves per capita).⁸

Third, Malaysia and Chile (albeit to a lesser extent) are amongst the few resource-rich countries that have experienced some degree of export diversification in the past 50 years, as shown by the following figure. Many resource rich developing countries have remained vulnerable to commodity price fluctuations. In order to draw lessons from resource rich countries that have succeeded in diversifying, we must first ask: which resource rich countries have succeeded in diversifying?

⁸ In other words, from a political economy perspective, it makes little sense to draw generalization by comparing a country such as Chile or Malaysia with countries such as Norway or Qatar. As noted in Lahn and Stevens (2018:102-3), “Norway, often highlighted as the success story par excellence of extractives- led growth, had a developed democratic system of governance and a relatively small population at the outset of its discoveries [...] In this diverse context, policies that contributed to success in Norway will not necessarily work in other countries.”

Figure 1. Evolution of the composition of exports of selected resource rich economies



Source: World Development Indicators (2018)

Figure 1 shows that countries such as Algeria, Saudi Arabia and Venezuela have remained extremely dependent on petroleum exports in the past 50 years and failed to diversify, despite a series of ambitious diversification plans in all three countries. Now-developed countries such as Norway and Australia have respectively become even more dependent on petroleum and mining exports since 1970. Ecuador experienced high degrees of cyclical fluctuations without managing to decrease its reliance on petroleum on the long run. Consequently, resource-rich countries that need to diversify their export basket should investigate the path followed by Malaysia and Chile, as opposed to that of Norway or Australia. Those observations explain why Chile and Malaysia have been selected for further study in this thesis in order to investigate what have been the underlying engines of diversification in both countries and how those can be applied to resource-dependent developing economies.

Malaysia has progressively diversified and expanded its export basket over 50 years of post-independent development. Manufacturing exports reached 80% of total exports by 2000. The electronics sector account for the bulk of Malaysia's manufactured exports. Nevertheless, as chapter 7 shows, Malaysia has also managed to leverage its rubber, palm oil, and petroleum industries to diversify and expand its industrial base. In addition to diversifying its productive structure, Malaysia has also sustained one the highest growth rates among middle-income countries in the period 1970-2000.⁹

Chile offers a different type of resource-based development outcome. Unlike Malaysia, Chile has mostly diversified towards other commodities (e.g. salmon, wine, forestry and fruit products) and has not emerged as a major industrial exporter. Chile's diversified commodity exports mostly consist in high-value primary-based products. Chile has indeed been one of Latin America's fastest-growing economies in recent decades. The case of Chile is particularly relevant because it has long been held up as an almost textbook example of the success of "letting the market work". A broad agreement exists among mainstream economists that Chile has largely succeeded in promoting strong and

⁹ In the fifty years following independence, Malaysia multiplied its per capita income by 24 times and GDP grew at about 6% per annum. Despite an interruption in GDP growth by the Asian financial crisis in the late 1990s, Malaysia recorded a faster recovery than its neighbours.

stable growth because it has embraced free-market policies (See Friedman, 1982; Richard, 1997; amongst many others). However, the evidence presented in this study debunks the myths associated with Chile's economic development.

When making evaluations and comparative conclusions, it is useful to put accomplishments in a proper context and be clear about the basis of the comparison. It is worth noting that when Malaysia is compared with East Asian economies, it is can be presented as a “failure” case of an economy that fell into the middle-income trap and has lagged behind. However, when Malaysia is compared with other developing countries or resource rich countries, its developmental achievements are laudable. Indeed, as noted in Yusof (2007), one needs to be reminded that not much hope was showered on Malaysia on its survival as an independent state in 1957 because of its unstable conditions (such as its ethnic diversity). In that sense, a suitable comparator would be Sri Lanka (a country with similar ethnic divisions that is also a former British colony), but interestingly, the trajectories of development in the two countries have moved in the opposite direction (ibid.). Hence, this thesis is careful in avoiding framing the Malaysian case (or Chilean case for that matter) as an unequivocal success story for development and whose lessons can be applicable to all developing countries (this thesis will also put forward both the limitations of their development strategies). If that had been the objective, a case study such as South Korea or Singapore would have been more adequate. Instead, the main rationale for choosing a case such as Malaysia lies in its potential contribution to the literature on resource rich countries due to its considerable diversification over the past 50 years and its use of resources rents to spur industrial growth.

1.3.4 Data sources and analysis

The access to comparable data is a major concern when conducting comparative research. The methods of data collection may vary considerably from one country to another. For certain topics, data might exist in one country and yet be inexistent in other countries, for various reasons, such as lack of interest among policy-makers, lack of capacity to gather

statistics nationally, lack of transparency when it comes to data sharing, etc.¹⁰. Despite the considerable progress in the development of large-scale harmonized international databases, such as the World Development Indicators, quantitative comparisons remain problematic if they are not accompanied by a deeper understanding of the context in which phenomena are located (Hantrais, 1995). As a result, this study has also relied on fieldwork interviews, as detailed below, in order to better understand the strategies that lie behind certain policies.

As a result, this study relies on both quantitative and qualitative data to identify trends and patterns, as well as to explain them. Indeed, quantitative data is required for comparing variables such as GDP growth, export diversification indices, inequality and unemployment rates, sector composition of employment, export and manufacturing outputs, etc. In contrast, qualitative data is far more informative when analyzing aspects such as the role of state-owned extractive companies in both countries, whether industrial policies have targeted sectors, the purpose of the sovereign wealth funds, reasons and objectives underlying the promotion of certain sectors over others, why certain policies were more successful than others, etc.. This thesis also relies on both economic statistics from secondary sources such as government reports, international institutions reports, and international databases (such as the World Development Indicators, the IMF export diversification toolkit, UNIDO statistics, amongst others), and primary qualitative data collected by conducting interviews with policy-makers (former and current), scholars, business executives, civil society representatives and other experts.

While country comparisons can be plagued by a lack of knowledge or understanding of different cultures and languages, interviews also contribute to situate social, economic and political processes in their historical and ideological contexts. Indeed, interviews with different stakeholders enabled me to understand the factors underlying the formulation and the implementation of policies, including their context, objectives, and challenges. The inclusion of a variety of stakeholders also enabled me to take into account different angles and perspectives around the same issues. This study relies on

¹⁰ For instance, quantitative micro-level data is accessible on local suppliers in mining sector in Chile but such data is not accessible for Malaysia.

fieldwork interviews with over 80 people, taking place over several field trips. Field trips were principally carried out in Malaysia and Chile between February and August 2017. I also carried out field trips to Algeria and Ecuador, despite their non-inclusion as main case studies of this thesis due to various reasons, including word limit considerations and data availability issues. These visits have nonetheless helped me situate Chile and Malaysia in the wider context of diversification efforts and practices amongst resource-rich and resource-dependent economies. The interviews were semi-structured, with research questionnaires adapted to each interviewees' background and experience, in order to allow for the collection of additional contextual information based on what interviewees deemed relevant. Information provided by interviewees has also been verified and cross-checked when it was publically available in order to account for potential biases or misinformation.

1.4 SUMMARY OF CHAPTERS

Part I (chapter 2, 3 and 4) presents the conceptual framework of this thesis. Chapter 2 lays out the conceptual framework that governs the empirical work in this thesis. Existing literature is reviewed in order to identify theoretical gaps. Linkages theories are also revisited to inform our discussion of diversification pathways in resource rich countries. Three major diversification pathways are identified: vertical diversification, horizontal diversification, and financial diversification.

Chapter 3 is dedicated to the issue of measuring natural resource abundance and dependence. Current approaches and their limitations are reviewed before introducing a new multidimensional method to measure resource endowment. Such a method also serves as the basis of a diagnostic tool that helps identify what are the specific challenges of resource-based development faced by given countries at a given time.

Chapter 4 addresses the political economy of resource revenue management. It provides evidences for variations in economic development patterns across resource-rich countries, by highlighting the factors that influence the outcomes of different resource revenue management strategies. This chapter subsequently explains why the domestic investment of resource revenue should be prioritized in some countries over others.

Part II (chapter 5,6,7,8 and 9) provides a comparative study of diversification objectives and outcomes in Chile and Malaysia from the early 20th century onwards.¹¹ Chapter 5 examines the case of fiscal management of resource revenues in both countries. Chile is often put forward as a success story of management of copper revenues, particularly thanks to its counter-cyclical fiscal policy. However, the fiscal stabilization agenda of copper revenues has been conducted at the expense of long-term structural transformation. In contrast, in Malaysia, the public investment of petroleum revenues has had a long-term transformative effect on the domestic economy.

Chapters 6 and 7 examine vertical diversification strategies in Chile and Malaysia respectively. Chapter 6 focuses on the Chilean experience of linkage development in the copper sector and argues that copper extraction in Chile has been characterized by weak industrial linkages due to important market obstacles and timid public policies to incentivize value addition. Chapter 7 finds that resource-based industries have played a key role in Malaysia's diversification thanks to a pro-active role of the state in promoting linkage development in the face of market obstacles.

Chapters 8 and 9 examine horizontal diversification strategies and outcomes in Chile and Malaysia. Chapter 8 departs from the conventional wisdom associated with Chile's so-called 'free market miracle'. By analysing the dynamics underlying the emergence of the salmon, fruit, forestry and wine sectors in Chile's export basket, it sheds light on the crucial role of industrial policy in the process of capabilities accumulation that has shaped the emergence of new industries. Chapter 9 examines Malaysia's export diversification towards new sectors by comparing and contrasting the development of the electronics and electrical industry and the automotive industry. It finds a high level of heterogeneity in terms of performance as well as strategies underlying these two sectors.

Chapter 10 summarizes the findings of this thesis in relation to the role of the state for resource based development and economic diversification.

¹¹ For more extensive historical accounts of economic development and industrial policy in both countries, see Jomo (1993), Lall (1995), Salleh and Meyanathan (1993) for Malaysia; and Agosin et al. (2010) and Bravo-Ortega and Eterovic (2015) for Chile.

PART I:

CONCEPTUAL FRAMEWORK

Chapter 2: Critical Literature Review

2.1 OVERVIEW

This literature review is built around three main dimensions of the relationship between natural resources and economic development. The first dimension is the *correlation* between natural resource abundance and development. As such, the first section of this chapter examines the literature on resource determinism (featuring both resource optimism and pessimism). It also reviews the political and the economic factors underlying the resource curse thesis and reaches the conclusion that natural resource abundance is not inherently a curse nor a blessing and further sheds light on the need for alternative explanations of variations of development across resource-rich countries.

The second dimension that this chapter delves into is *how* natural resources may contribute to economic development by outlining the different linkages between commodities and the rest of the economy. While resource pessimism assumes an ‘enclave’ nature of commodity extraction, resource optimism emphasizes the synergies between commodities, manufacturing and service activities. This literature review aims to go beyond reductionist analyses of the linkages arising out of commodities and draws on existing linkage theories to construct a new taxonomy of diversification pathways around commodities. Three main diversification paths are identified: vertical diversification, horizontal diversification, and financial diversification.

The last area reviewed in this literature review relates to the role of the state in shaping the relationship between natural resources and economic development. Specifically, the last section reviews the literature on what type of government involvement is necessary for maximizing the impact of resource extraction on diversification. Despite a growing recognition of the role of policy actions to harness natural resources for growth, the academic literature on resource-based development remains divided regarding the role of industrial policy in promoting different diversification pathways.

2.2 CORRELATION BETWEEN NATURAL RESOURCES AND ECONOMIC DEVELOPMENT

Over the past century, the relationship between natural resource wealth and economic development generated significant debates. Such debates have been characterized by both resource optimism and pessimism, with one or the other being dominant at any particular time (Addison and Roe, 2018; Lahn and Stevens, 2018; Stevens, 2015). In particular, those debates have focused on the effect of mineral wealth on industrial development, owing to the growing academic acknowledgement that industrialization is important to sustain economic growth (see Andreoni and Chang, 2016; Chang, 1993, 2005; Hauge, 2017; Kaldor 1967; List, [1837] 1983; Myrdal, 1956; Palma, 2014; Prebisch, 1950; Rowthorn and Ramaswamy, 1999). Section 2.2 starts by reviewing the received wisdom on the negative impact of natural resources on industrial and economic development, before reviewing the literature exploring the positive correlation between natural resources and economic development.

2.2.1 *The ‘Resource Curse’ literature*

Influential studies, such as Auty (1993, 1994) and Sachs and Warner (1995, 1997), found a negative relationship between economic growth and resource dependence and concluded that countries with large natural resource endowments, such as oil and gas, are more likely to perform worse than others in terms of economic development, because of a phenomenon that they call the “resource curse”. This observed negative correlation generated a large literature that sought to explain it. It has been argued that fiscal inflows from natural resources generate both market and government failures that impede economic growth and industrialization (Beblawi and Luciani 1987, Bhattacharyya and Hodler, 2010; Gylfason, 2001; Ross, 1999). We can indeed distinguish political explanatory factors of the resource curse (rentier state theories, rent-seeking, conflict, corruption, etc.) from economic factors (volatility of commodities cycles, Dutch disease, etc.).¹² Nevertheless, as the next section shows, none of these factors are inevitable and

¹² See Ross (1999) for an extensive review of the explanatory factors of the resource curse.

there is nothing inherent about natural resources that make them detrimental for development. In addition, an increasing number of studies have questioned the theoretical and the statistical credibility of the resource curse hypothesis (Echavarria, Vázquez Moreno, and Sherdek, 2016; James, 2015; Lederman and Maloney, 2007).

2.2.1.1 Economic explanations of the resource curse

There are three main economic explanations of the resource curse: the Dutch disease, commodity price volatility, and the enclave thesis (Ross, 1999).

The term ‘Dutch Disease’ was initially coined to describe the observed collapse of the Dutch manufacturing sector following the discovery of natural gas in 1959. Corden (1984) modelled this effect to show how capital moves away from non-oil tradables as oil booms and how an influx of foreign capital to the booming resource sector causes an appreciation in the currency. Sachs and Warner (1997, 2001) popularized this concept and argued that it was the major growth-impeding factor for resource-rich countries.

There are several interpretations of the Dutch disease phenomena, but it formally refers to two combined effects, which are (i) the appreciation of a state’s currency caused by the sharp rise in exports; and (ii) the tendency of a booming resource sector to draw capital and labour away from the country’s manufacturing and agricultural sectors. These two effects combined raise the production costs of the manufacturing and agricultural sectors and lead to a loss in their competitiveness (Neary and Van Wijnbergen, 1986).¹³

More importantly, there are also theoretical shortcomings of the Dutch disease model. Ross (1999) explains that this model relies on the assumption that capital and labor supplies are fixed and fully employed before a boom begins. Under such conditions, a booming resource sector indeed draws capital and labor away from agriculture and manufacturing, but developing states often have labor surpluses, and most importantly,

¹³ Some studies show that the Dutch disease is not a systematic phenomenon. Gelb et al. (1989) found that, out of seven selected oil exporters during the 1971-83 boom, only four countries showed a shift of labour and capital away from their agriculture and manufacturing sectors towards their resource sectors.

resource sectors often attract foreign capital and labor, offsetting any local scarcities (Tat Wai; 1988). Di John (2009) further notes that in addition to assuming full employment, the Dutch Disease model assumes static technology. This has considerable implications because, when a country faces a technological gap, additional foreign exchange can help close such gap through the increased import of advanced technology. The Dutch disease can thus be avoided when revenues from resource booms are used to promote the competitiveness of an industry through protection, subsidies, or financial incentives and can serve to modernize the manufacturing capital stock, which in turn can improve productivity (ibid.). Governments can also counteract Dutch disease effects by investing their resource revenues in growth-enhancing physical infrastructure or placing their windfalls in foreign currency (to keep their currency from appreciating).

Cashin and McDermott (2002) found that volatility was more damaging to commodity producers than a predictable and stable decline in commodity prices.¹⁴ Nevertheless, there are many instruments that governments can use to mitigate the volatility of commodity revenues. These include stabilization funds and careful fiscal rules to smoothen government expenditure and offset the boom-and-bust cycles associated with commodity revenues. Those instruments are discussed in further detail in chapter 4.

Another explanation for the resource curse is that natural resources generate poor economic linkages between resource and non-resource sectors, especially when foreign firms lead commodity extraction activities and repatriate their profits instead of investing them locally (Hirschman, 1958). The “enclave thesis” advocates that mineral resources are particular because they are capital intensive, concentrate ownership and consequently generate fewer production and consumption linkages in developing countries than more ‘diffuse’ resources (Auty, 2001; Auty and Gelb 2000; Hirschman, 1981; Singer, 1950).¹⁵

¹⁴ Commodity price volatility has even grown more problematic since the financialisation of most commodity markets since the mid-1990s (Farooki and Kaplinsky, 2012).

¹⁵ As Morris et al. (2012) explains, soft commodities are usually characterized by low technological content, small-scale production, high labour intensity and often have short shelf lives, necessitating processing soon after production. Hard commodities (e.g. metals) generally involve complex technologies, capital-intensive production and infrastructure that can be used by other sectors (such as roads and rail links). Energy commodities (e.g. oil and gas) have similar

However, there is in fact little evidence for the ‘enclave’ thesis. Fosu’s (1996) study of seventy-six developing countries finds that growth in commodity exports between 1967 and 1986 has a negligible effect on the performance of the non-export sector, probably because governments took strong measures (such as nationalization) to capture the economic rents once repatriated by foreign multinationals in the 1970s (Ross, 1999). Governments thus appear to have the capacity to foster linkages, yet have commonly failed to do so (ibid.). Having said all this, the issue of poor economic linkages is more complex than simply appropriating resource rents and deserves particular attention. Section 2.3 of this chapter is dedicated to discuss the different types of linkages between natural resources and other segments of the economy.

2.2.1.2 Political explanations of the resource curse

While economic factors may create some obstacles for resource exporters, it appears that the effect of resource wealth is not pre-determined and depends on policy responses (Neary and van Wijnbergen 1986; Gelb and al. 1988). The real question behind the resource curse is consequently why governments often fail to take corrective action (Ross, 1999; Saad-Filho and Weeks, 2013). Three main explanations have been offered: (1) cognitive explanations, (2) rentier state explanations, and (3) societal explanations.

(1) Cognitive explanations, mostly prevalent in the 1950s and 1960s, but also echoing arguments previously made by Ibn Khaldun in the 14th century and Jean Bodin in 16th century, contended that resource booms or ‘easy wealth’ produce a type of paralysis or shortsighted euphoria among policymakers (e.g. Watkins, 1963).

The cognitive approach has several shortcomings because state actors are often aware of the dangers of resource booms. Di John (2009) notably criticizes cognitive explanations of Venezuela’s poor economic performance in the period 1973-98, according to which macroeconomic instability was caused by the government’s inability to anticipate that oil

characteristics to hard commodities, apart from the infrastructure they involve, which has fewer externalities to other sectors. Singer (1950) thus argued that when it comes to mineral resources (hard and energy commodities), linkages in low-income countries would be generated abroad in the absence of a developed local industrial base.

revenues would not be permanent before investing oil revenues into large-scale industrial projects. While it captures part of the problem, such argument does not explain “why short run economic crises necessarily prevented a long run transformation of the economy or why other resource rich countries (such as Malaysia) that have experienced substantial macroeconomic crises were able to transform the structure of their economies in ways that contributed to rapid long-run growth” (Di John, 2009:37). Indeed, according to the World Bank (1989), Malaysian leaders severely overestimated the resource available to undertake large scale, heavy industrial investments, but this did not prevent them from making transformative and growth-conducive investments.

(2) Rentier state explanations are the most common explanations for the resource curse. Ascher (1999) argues that the reasons underlying poor resource rent management policies are more complex than just ignorance of what constitutes good resource management or greed. Because resource rents provide an easy and low-visibility source of financing, governments may jeopardize efficient natural resource management to achieve other ends, such as the financing of controversial development programmes, redistribution and elite capture, or more ‘political’ objectives such as patronage, or maintenance of the status quo (see Lane and Tornell, 1999; Mahdavy, 1970). Anderson (1987) adds that rentier states favour egalitarian consumption over development policies. Karl (1997) finds that there are strong similarities amongst states such as those of Algeria, Venezuela, Nigeria, Saudi-Arabia, or even 16th century Spain. In almost all cases, the state is the direct recipient of the rent wealth, which reduces the need for taxation, which in turns erodes the nature of the social contract between the government and citizens (ibid). Other studies also found that natural resource endowment negatively impact democracy and institutions (see Sala-i-Martin and Subramanian, 2003; Jensen and Wantchekon, 2004).

While rentier state explanations offer useful insights, they rely on unconvincing assumptions. First, ‘unearned’ incomes prevent the establishment of a social contract through taxation and accountable governments, who consequently have fewer incentives to formulate growth-enhancing policies. However, if governments in resource rich countries are less accountable, why would they still feel the need to buy social consent with excessive redistribution? Countries such as the United Arab Emirates show that the

absence of income taxes does not prevent government from formulating growth-enhancing policies. Second, the assumption that leaders inherently have selfish motivations is reductionist and fails to recognize that many governments in resource-rich countries (e.g. Algeria and Venezuela in the 1970s) have attempted the creation of developmental states, and that they did not succeed not only because of ‘selfish motives’ but most importantly because of the poor design of their industrial strategy. Even if leaders have selfish aims, it is not clear why it should prevent them from maximizing growth. This point is captured by Olson’s (1993) concept of the stationary bandit, according to which a leader who has a long time horizon has the incentive to promote growth, since this will maximize the revenues flowing to the state in the long run.

(3) Lastly, the resource curse has also been explained by “societal explanations”, which emphasize the power of non-state actors in resource rich countries in favouring inefficient industrial policies (Ross, 1999). Sachs and Warner (1997, 2001) argue that resource-rich countries tend to feature protectionist policies that lead to economic stagnation because firms in lagging manufacturing sectors affected by the Dutch Disease demand compensation in the form of trade barriers. The argument that resource abundance leads to the maintaining of ISI policies long after they become counter-productive has often been used to explain why resource-rich Latin American countries lagged behind resource-poor East Asian countries in the 1970s and 1980s (Ross, 1999). However, this argument may fail to explain why East Asian countries also maintained protectionist measure for several decades before infant industries finally became globally competitive.

2.2.2 Resource optimism

The staple theory, formulated in the 1920s and 1930s by scholars such as Innis (1930, 1940, 1956) and Mackintosh (1923, 1939), emphasized the role of commodities as a motor of economic development. It stated that primary products exports stimulate growth in less developed areas by attracting capital and labor, and that exports of raw materials can trigger growth if investment is continuously made to reduce cost of production and transportation to export commodities. A few decades later, several development economists such as Viner (1952), Lewis (1955) or Spengler (1960) also suggested that

resource abundance would help developing countries, which were thought to suffer of labour surplus and capital shortages.

In the past two decades, a plethora of studies have found a positive correlation between natural resource abundance, and economic and human development indicators, directly challenging the resource curse thesis (See Bravo-Ortega and De Gregorio, 2007; Brunnschweiler, 2008; Davis, 1995; Findlay and Lundahl, 1999; James, 2015; Pineda and Rodriguez, 2010).

A key statistical misconception behind some of the resource curse literature such as Sachs and Warner (1995, 1997) lies in the fact that they calculate resource wealth by looking at the share of natural resources in GDP. This is problematic because it misclassifies resource poor countries that do not produce anything else than primary commodities as resource wealthy. Lederman and Maloney (2007) provide evidence for the implications of this shortcoming. By adopting a different measure of resource abundance (net resource exports per capita rather than the share of natural resources in GDP), they conclude that high-income countries such as Norway, New Zealand, Canada, Finland and Australia rank as the most resource-intensive economies globally, rather than DRC and Papua New Guinea as in Sachs and Warner's analysis.

2.2.3 Concluding remarks

It thus appears that natural resources are not necessarily detrimental to economic development and that the 'resource curse' thesis is a model that is essentially an observation rather than a systemic explanation. Morris et al. (2012) conclude that high resource dependence is more often the consequence of an unrelated underdevelopment of the industrial sector than a negative impact of the mineral resource sector. Thus, "[what is interpreted] as a manufacturing sector weakened by a commodities specialization, is in fact often a commodities specialization in an economy with no or little history of industrial development" (ibid.:8). If the effects of resource abundance are not predetermined, we need to explain how natural resources may contribute to industrial development and diversification more broadly. The following section examines the different types of linkages that can arise from commodities sectors towards other sectors.

2.3 LINKAGES ARISING OUT OF NATURAL RESOURCE SECTORS: TOWARDS A TAXONOMY OF DIVERSIFICATION PATHS

This section starts by reviewing in more detail the literature on linkages arising out of commodities. This section then adapts, combines and completes existing linkage-based theories in order to build a novel framework of diversification paths.

In his pioneering work, Hirschman (1981) suggested three major types of linkages from natural resources to the industrial sector: fiscal, consumption and production linkages. Fiscal linkages are the resource rents appropriated by the government, which can be used for investment in industrial sectors unrelated to commodities. Consumption linkages relate to the demand for domestic production arising from the incomes earned and expenditures in the commodities sectors. Production linkages can be both forward (processing and the further transformation of commodities) and backward (producing inputs for commodity production).

Morris et al. (2012) further contributed to the discussion on linkages by highlighting ‘horizontal linkages’, which are defined as “a complex set of linkages made up of suppliers and users in the chain, who develop capabilities to feed into other industrial and service chains” (2012:24). Similarly, several works have emphasized the important types of externalities that arise out of extractive activities and that can benefit other sectors of the domestic economy, such as infrastructure and knowledge. Whether those elements should be considered as linkages or externalities is debatable, but the literature has often labeled those as ‘side-stream linkages’ (see CCSI, 2016a; IRP, 2019).¹⁶ As further explained in section 3.2.2 of this chapter, I have adapted, grouped, and further refined notions of “horizontal” or “side stream linkages” under the concept of *transversal capabilities*, which include (i) technological and organizational skills; (ii) shared infrastructure; and (iii) ‘product linkages’ (which I have defined as goods with a wide

¹⁶ The Columbia Center on Sustainable Investment (CCSI, 2016a) defines ‘side stream linkages’ as relating to the know-how and infrastructure necessary for the resource value chain to function, which can be sub-divided into ‘knowledge linkages’ and spatial (infrastructure) linkages, which relate to the benefits associated with the infrastructure (such as power, logistics; communications, water) developed for an resource extraction project.

applicability to different sectors and activities). The nuances between these three different mechanisms of *transversality* have not been given proper consideration under existing typologies, which motivates the new taxonomy of linkages developed in this study.

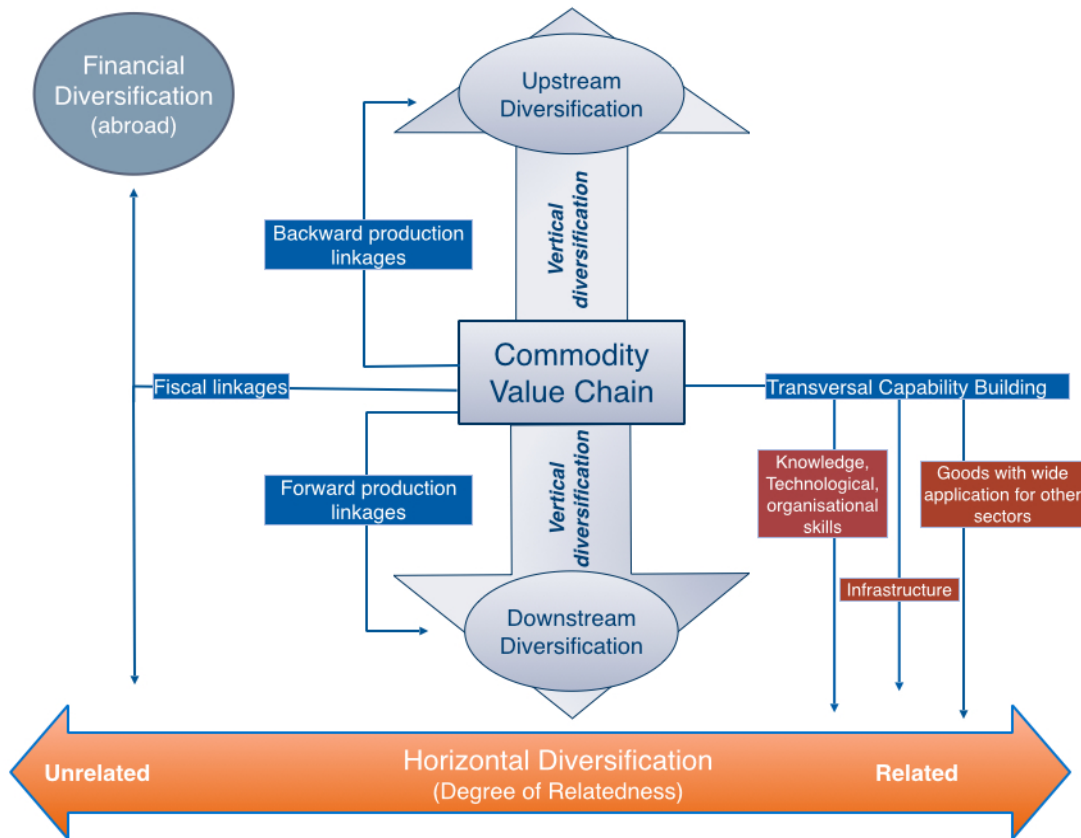
The discussion on linkages around commodities can inform the debate on diversification strategies. While economic diversification is considered almost unanimously to be a fundamental policy goal for resource-dependent countries, the direction in which diversification ought to take place is subject to fierce debate (Coniglio et al., 2018). In this perspective, figure 2 identifies three main diversification pathways:

1. Vertical diversification (both upstream and downstream)
2. Horizontal diversification towards new sectors (with various degrees of relatedness)
3. Financial diversification (investing resource revenues to generate rents)

The taxonomy in figure 2 is essentially a combination and application of different linkage development models (e.g. Rosenberg, 1976; Hirschman, 1981; Morris et al., 2012).

The three broad diversification routes outlined in this taxonomy entail three different “roles” for the commodities. The use of fiscal linkages to promote both financial diversification and horizontal diversification relies on commodities as a source of capital. Vertical diversification strategies entail a role of commodities as products in a value chain. Lastly, related diversification through transversal capability building relies on commodities as a source of production capabilities.

Figure 2: Mapping out diversification paths arising out of commodities



2.3.1 Vertical Diversification

Vertical diversification implies both upstream and downstream diversification. Upstream diversification relates to the localization of supply of goods and services required as inputs for commodity exploitation.¹⁷ Downstream diversification entails value addition, through processing (adding value before become an input to another industry) and beneficiation, which is understood as the process of transformation in which the

¹⁷ Another important distinction noted by Tordo et al. (2013) and Morris et al. (2012) and concerns is the issue of defining ‘local/domestic’. Indeed, local linkage does not necessarily mean local ownership because the company from which an input is purchased could be locally-based but foreign-owned. Larsen, Yankson and Fold (2009:259) illustrate this distinction with the example of Ghana, where “a number of basic services, such as laboratory testing, cleaning, security and various consultancy tasks, are still outsourced, but to foreign companies with subsidiaries in Ghana, not to locally owned companies”.

processed commodity is converted into an entirely different product, generally in an unrelated manufacturing activity (Morris et al. 2012).¹⁸

Several authors (Bond and Fajgenbaum, 2014; Hirschman, 1981; Mackintosh, 1923; Maloney, 2002; Morris et al. 2012; Ovadia, 2016a) have suggested that vertical integration was the best avenue for diversification in resource rich countries.¹⁹ Within this view, some have emphasized the need to focus on downstream diversification (e.g. Goldthorpe, 2015) while others have emphasized upstream diversification (Ovadia, 2016a, 2016b).

Morris et al. (2012) even sustain that, while resource pessimism led to the wisdom that countries should diversify by expanding their industrial and knowledge-intensive sectors in areas unrelated to their commodities, the paths that successful late-industrializing economies such as East Asian countries followed are difficult to emulate by currently resource-rich developing countries for two reasons. The first relates to the reduced space available for import substituting industrialization, due to WTO agreements, FTAs and BITs. The second reason arises out of the blockages of opportunities in the route to

¹⁸ An example of beneficiation is the transformation of aluminum into pots and pans. In the oil industry for instance, developing forward linkages mean the establishment of refineries, petrochemical industry, and the production of fertilizers. In addition, it is worth noting that oil can represent many different types of outputs. Indeed, oil could also be seen as a source of energy, rather than a particular chemical substance, which is why many oil rich countries use their “competitive advantage” to develop aluminum industries, which are very energy intensive.

¹⁹ As early as the 1920s, advocates of the staple theory, which started out as an explanation of Canada’s industrial development, even argued that the reallocation of factors of production to non-staple production would slow economic development (Altman, 2003). Staples theory advocates feature divergent views on the extent to which economies can diversify through commodity specialization. On the one hand, Mackintosh (1923; 1939) saw an evolution of staples production towards a mature staple-based-industrialized economy, economic diversification and self-sustaining growth, rather than the risk of a ‘staples trap’. On the other hand, Innis (1930; 1940; 1956) had a more pessimistic conception of the relationship between staple production and economic development. While he recognized that the commodities specialization did initially contribute to the development of domestic industry and infrastructure in the early years of exploitation, he also noted a tendency for Canada to become permanently locked into dependency as a ‘resource hinterland’. Indeed, Innis was not confident that a staple based-economy will be able to diversify and ‘develop’ rather than simply ‘grow’. North (1966) echoed this argument but noting that after the initial stage of synergistic linkage development between staple crops and local industry and services, the American south fell into a ‘staples trap’ and linkages were located in other regions of the US.

export oriented industrial development: once all economies take the same route, its attractiveness is diminished which is particularly the case when a very large economy – such as China – becomes a major actor in international trade and renders export oriented industrialisation more difficult to achieve for follower economies in many sectors (ibid.:15). As a result, they argue that resource-rich low-income economies should follow a diversification path that focuses on production linkages around their commodities rather than attempt to build a competitive advantage in unrelated industries.

However, several counterarguments can be provided. Firstly, the argument related to blockages of opportunities in the route to export-oriented industrial development by countries such as China does not only apply to new industries but also to upstream and downstream industries in the commodity value chain. Chapter 6 shows that value addition in the copper industry is “blocked” by producer-driven constraints posed by China’s competitive advantage in copper smelting, coupled with Chile’s dependence on Chinese copper imports.

Secondly, it is important to consider the issue of industrial dependence on commodity sectors and the consequent vulnerability to commodity price swings. It can be questioned whether diversifying along the commodity value chain is the best way to *diversify*, precisely because such diversification may perpetuate the dependence of economic sectors on commodity price fluctuations. Local suppliers of goods and services to extractive sectors may indeed suffer from the reduction in investments in exploration and production in extractive activities as a result of low commodity prices. In addition, the desirability of building linkages around a commodity depends on the exhaustibility of reserves. If countries run out of oil or copper, they might need to import it to keep operating related industries. In that sense, the argument by the staple theory advocates that the reallocation of factors of production to non-staple production would slow economic development fails to recognize the need to diversify beyond commodities and develop productive capabilities in other sectors, especially in countries where natural resources are volatile, exhaustible and not labour-intensive enough to cover national employment needs.

Thirdly, there are other concerns to consider when dealing with policies to increase production linkages around commodities. While these policies could generate economic benefits, we should question what are the costs (and particularly opportunity costs) of implementing these policies rather than investing in unrelated diversification. It can be argued that there are considerable market barriers to commodity value addition, which explains why policies to increase vertical integration in extractive sectors have achieved mixed results (Tordo et al., 2013).²⁰ It is thus important to consider input costs in vertical diversification, which can affect the commercial viability of downstream and upstream activities.²¹ For instance, the oil and gas industries are characterized by high capital investment, specialized input, technological complexity, and highly globalized supply chains, which often create barriers to local participation, especially in countries with little existing capacity (ibid.). As a result, the most easily accessible activities to local participation may not imply great degrees of capabilities, which in turn reduces prospects of transversal linkages to other sectors and further increase industrial dependence on commodities, and thus continued vulnerability to volatility. In that sense, the role that technological factors play in linkage development is very important. Hirschman (1981:167) recognized that “perhaps the principal reason why it is difficult to establish backward and forward linkage industries around the staples is not so much that, as argued originally, there are fewer linkage effects in agriculture than in industry, but that they largely point to industries whose technologies are alien to the grower of the staple. Hence, for a very long time these industries are carried on abroad.”

Consequently, the fact that an activity is related to a country’s commodity does not necessarily mean that it is “easier” to enter. This may explain why Hausmann and Klinger’s (2007) theory of product-relatedness entailed an understanding of relatedness that is different from the existence of linkages: “looking downstream from existing production is a very poor guide to identifying high-potential export sectors. Most

²⁰ Governments have attempted to promote upstream diversification through so-called local content policies, although their application is increasingly restricted by WTO agreements.

²¹ An example of costly value addition is the aluminum sector. While aluminum is mainly made of bauxite, the most expensive input is energy. Hence, ‘value added’ considerations should not lead a country to move into the aluminum industry just because it produces a lot of bauxite.

countries do not move down production chains over time; they are more successful at moving to other activities that require similar sets of productive capabilities rather than those that are simply related in an input-output relationship” (Klinger 2008).²² This view somehow stands in contrast with the idea that countries have a natural market-driven ‘comparative advantage’ in developing linkages around their commodities and the idea that ‘one thing leads to another’ through a logic of market forces alone.

2.3.2 Horizontal Diversification

In my framework, horizontal diversification is divided into unrelated and related diversification. The concept of relatedness can be interpreted in several ways and is often associated with vertical integration (that is, activities alongside the commodity value chain). However, in the framework of this thesis, the concept of related diversification is broader as it entails the production of goods in sectors that use similar technologies, infrastructure, inputs or production organisation to the already established extractive sectors. This is different from vertical integration, which is expanding production along the commodity supply chain. Although I treat “related” diversification as a process different from vertical integration, the processes do overlap. Vertical integration may entail different degrees of beneficiation that can lead to ‘related’ diversification, if the value-adding sectors can be categorized as non-commodity sectors (even though they may be part of the same value chain). For instance, the production of pharmaceutical goods that derive from petrochemicals could be considered as both downstream diversification as well as ‘related’ diversification. However, the production of offshore wind energy by leveraging expertise and the equipment used for offshore petroleum platforms would be a case of related but not vertical diversification.

Unrelated diversification, meanwhile, is understood as the emergence of sectors that are unrelated to the commodity sector or situated outside a country’s current productive structure. It should be stressed that the concept of relatedness is not understood here in binary terms but instead in gradual terms. In practice, complete ‘unrelatedness’ is rare. As a result, I prefer to talk about degrees of relatedness.

²² Debates on the meanings of product relatedness are further reviewed in section 4.3.

2.3.2.1 Unrelated horizontal diversification

If we turn to historical experiences, it seems that several resource rich countries have successfully undertaken unrelated horizontal diversification.²³ Unrelated diversification may be needed to create more employment opportunities for the segments of the population excluded from the natural resources sector, as well as mitigate the volatility caused by oil price fluctuations. As Chang (2007) explains, “in order to achieve sustainable long-term development, countries need to use their natural resource rents in order to diversify into unrelated industries that are the most technologically dynamic”. Unrelated diversification can indeed be promoted through fiscal linkages, which relates to the investment of resource rents in other sectors of the domestic economy. In addition, in some resource sectors that have often considered as an enclave with few dynamic forward or backward linkages, fiscal linkages are central to processes of economic diversification and particularly industrialization (Di John, 2009). A strategic use of fiscal linkages could consequently orient resource-based development towards industrial diversification rather than falling into commodity dependence.

2.3.2.2 Related horizontal diversification through transversal capabilities

Related diversification is different from diversification through vertical integration. In my framework, what I mean by ‘related’ diversification relates to the products and activities that arise from technological, organizational, product and spatial/infrastructure linkages from commodity sectors. Those types of linkages are different one from another, and different from related diversification through the beneficiation of commodities.²⁴

2.3.2.2.1 Technological Linkages

Technological linkages were already put forward by Rosenberg (1976:30), who argued

²³ Copper-rich Chile has developed competitive salmon, fruit, forestry and wine industries. Malaysia has diversified towards the palm oil, rubber electronics sector. Indonesia diversified towards its agriculture and manufacturing sectors. Dubai, once specialized in pearls production, also diversified into financial services, airlines services and luxury tourism (Bauer, 2016).

²⁴ As noted earlier, those linkages are often grouped together under the label ‘horizontal linkages’ or ‘side-stream linkages’. That said, it may be worth distinguishing them from each other.

that producing certain things successfully (e.g. rifles) creates a capacity for producing other things (such as sewing machines, bicycles and automobiles). Andreoni (2018) further adds that technological linkages imply forms of inter-sectoral learning (with various degrees of ‘technological strangeness’ and complementarity).

Most of the ‘enclave thesis’ advocates have underestimated how technological linkages arising out of the mineral sector can spur development. In contrast, several studies have argued that the high technological knowledge embedded in the mining sector generated spill-overs to other, thereby promoting the development of today’s industrialized economies, such as the USA, Australia and Scandinavian countries (Blomstrom and Kokko, 2007; Wright and Czelusta, 2004).

A lot more research needs to be conducted on the technological spill-overs the commodities sectors. Unfortunately, such way of addressing technological linkages have mostly been neglected in both academic and policy circles. In this thesis, chapter 6 provides examples of technological linkages in the Chilean copper mining supply sector, while chapter 7 provides examples of such linkages in the Malaysian petroleum sector.

2.3.2.2.2 Organizational capabilities

Organizational capabilities relate to managerial and organizational skills that can be used in many sectors, rather than sector-specific technologies. Such capabilities may matter more than technological linkages, especially for products that are not technologically demanding or when the technologies are easily and cheaply accessible.

2.3.2.2.3 Product linkages

What I call ‘product linkages’ refers to the production of goods and services that have a wide applicability for various markets and can be used as inputs in other industries. They differ from technological linkages because technological linkages focus on the similarity and complementarity of production processes, while ‘product linkage’ focus on the applicability of products themselves. Product linkages are essentially about firms diversifying the markets for their products. As such, industrial policy should give preference to products that are less specific to a particular industry but instead have

broader applications and consequently can reap larger benefits from economies of scale. Examples of such product linkages include anti-corrosive industrial paint in the petroleum sector, especially on offshore platforms. As a result, in Congo (Brazaville), a local firm became a supplier of industrial paint for offshore platforms but then scaled up to produce for various markets utilizing industrial paint, both domestically and regionally. A similar example is reflected by water pumps production in Chile's copper sector, which also targets pumping solutions sold in different industries (petroleum, water, ship-building).

2.3.2.2.4 Spatial/Infrastructure linkages

Spatial/Infrastructure linkages relate to the benefits associated with the physical infrastructure developed for the extraction of commodities for other actors and activities in the domestic economy. Utilization of resource-related infrastructure (such as power, water, and transport facilities needed for the extraction, processing and export of the commodity) could support the establishment of other sectors, if those facilities are not built in an enclave with restricted access.

2.3.2.2.5 Concluding remarks

Interestingly, there can be some overlaps between different types of linkages. For instance, Malaysia has developed an indigenous shipbuilding industry to meet the domestic demand for maritime equipment and services in the oil sector, which could be considered as upstream diversification. However, the Malaysian shipbuilding industry has also enabled the accumulation of technological capabilities that later went into the production of offshore platforms (technological linkages), which are mostly made of locally manufactured steel (product linkage).

2.3.3 *Financial Diversification*

While several works on linkages have focused on production linkages at the expense of fiscal linkages (e.g. Hirschman, 1981; Morris et al., 2015; Ovadia, 2016a), another view holds that mining and oil and gas activities make little direct contribution to the local economy, except for the rents they generate (e.g. Bond and Fajgenbaum, 2014). This is

demonstrated in the case of Ecuador, where the oil industry appears to have few direct spill-overs to the rest of the economy and the main transmission mechanism from the oil industry to the rest of the economy is through the government's fiscal accounts. Indeed, Ecuador's oil sector accounts for only about 0.25% of employment and buys few inputs from other sectors, although it contributes about a quarter of government revenues and half of total exports (World Bank, 2010). In fact, Hirschman himself, despite his initial scepticism of the impact of fiscal linkages, recognized that "both fiscal and consumption linkages are likely to appear when other types of linkages are absent" (2013:169).

How do fiscal linkages contribute to the process of diversification? In the previous section, I have already mentioned the use of fiscal linkages to promote horizontal diversification. In addition, it is important to stress that fiscal linkages can also promote vertical integration. Indeed, fiscal linkages and production linkages are not necessarily mutually exclusive, which points out another assumption in Hirschman's conceptualization. It can be argued that resource rents can be impactful in developing countries since they relax fiscal constraints on growth and consequently provide the potential to support industrial diversification, not necessarily at the expense of the resource sector but as a complement to it (UNIDO, 2012).

In this section, I am addressing the role of fiscal linkages in promoting a third type of diversification, namely financial diversification. In the context of my taxonomy, the financial diversification strategy (through fiscal linkages) entails the use of an extracted commodity as a source of capital that can be invested in financial assets across the world in order to diversify a country's financial portfolio. This strategy enables a country to diversify the sources of foreign exchange generation and to 'live like a pensioner'. Such financial diversification strategies have been pursued by countries such as Qatar (through the Qatar Investment Authority), Norway (through the Norwegian Pension Fund), Chile (through the ESSF and the Pension's fund), and Botswana (through the Pula fund).

As further emphasized in section 4.2 and in chapter 4 of this thesis, there are several limitations to this type of diversification strategy. One of them is that this strategy is unlikely to allow the accumulation of productive capabilities. Another equally important

limitation relates to employment generation. Indeed, financial diversification (to “live like a pensioner”) may only be suitable – or achievable – in the context of very resource rich per capita (VRR) countries (see definition in chapter 4). Indeed, for medium resource-rich per capita (MRR) countries, the lower amount of resource revenues generated in relation to the size of the labour force means that employment needs cannot simply be met by ‘artificial’ employment in the public sector or through rents redistribution. As a result, these countries may require productive transformation to generate employment opportunities and growth, especially in times of low commodity prices, while VRR countries are more likely to afford high growth and employment rates even in the absence of domestic productive transformation.

There are thus three major pathways of diversification for resource-rich countries. The question that remains is: what is the role of the government in promoting each of those pathways? The next section reviews the literature on government intervention in the diversification process.

2.4 WHAT TYPE OF GOVERNMENT INTERVENTION IS NECESSARY FOR DIVERSIFICATION?

2.4.1 Overview

Section 2.2 has shown the recently renewed interest in the literature in moving away from natural resource determinism by investigating explanatory elements and policy options for managing resources revenues. Indeed, high resource endowment is not a pre-determined curse nor blessing and its impact on development depends on government actions. The question that thus arises is: what is the role of the government in harnessing natural resources for development? In particular, how should we conceive the role of the government in the context of the three diversification routes outlined in section 2.3?

The topic of industrial policy has been controversial within academic and policy circles, and mostly relates to which between the state or the market should take the lead in diversification. The debates have evolved around the dichotomy between state and market forces, with special attention to whether industrial policy should be limited to

correcting market failures or should govern the market by shaping the accumulation of productive capabilities.

The next three subsections review the literature on state intervention for vertical diversification, horizontal diversification, and resource revenue management. Each of these three discussions can be enriched by drawing on distinct literatures. The discussion on industrial policy for vertical integration draws on the global commodity chains literature. The discussion on industrial policy for horizontal diversification mostly draws on theories of comparative advantage from Neoclassical, developmentalist, evolutionary and neo-Schumpeterian perspectives. The discussion on the role of the state in investing natural resources revenues mostly draws on the literature on fiscal management, various resource revenue models rooted in Neoclassical or Marxist traditions, as well as early structuralist insights, which bring useful perspective that enables to “re-link” resource rents investment to the developmental objectives of industrialization and diversification.

2.4.2 Vertical Diversification

Hirschman (1981) was sceptical of the ability of the state to promote industrial development through fiscal linkages because he argued that such linkages do not provide guidance regarding which sectors should be targeted. Regarding consumption linkages, Hirschman argued that, while the demand in manufactured goods generated by employees who spent their income earned in the natural resources sector could potentially spur industrialization, these needs could be fulfilled by imports instead of domestic production, especially in the context of poorly developed domestic manufacturing sectors. This is why Hirschman (1981) believed that the forward and backward linkages from natural resources to industry were more likely to lead to economic diversification.

Hirschman did not explicitly address the respective roles of market and government forces in this process of production linkage development, but it seems that his idea that ‘one thing leads to another’ implies that production linkages unfold somehow ‘naturally’, accordingly to market forces. In Morris et al.’s (2012) interpretation, the idea that ‘one thing leads to another’ follows a logic of efficiency and of comparative advantage, which would ‘run against conventional wisdom that linkages only exist as a function of

government interventions'. While the recognition of market forces is important, I believe that such an interpretation is problematic for two reasons.

Firstly, such a view dissociates production linkages from fiscal linkages. Such mutually exclusive view of these two types of linkages leads to a failure to analyze the links and complementarities between fiscal and production linkages, which neglects the ways in which the investment of resource revenues by the government can target production linkages development (as shown in the Malaysian petroleum sector in chapter 7). Indeed, while several activities alongside commodity value chains have high entry barriers (because of their capital or technology intensive characteristics), resource rents generate foreign exchange that facilitates the purchase of foreign technology.

Secondly, even though Morris et al. (2012) recognize that certain contextual determinants, such as the 'policy environment', can help speed up the unfolding of production linkages, it can be argued that the scope for industrial policy is much wider than what they imply. For instance, scholars such as Radetzki (1977), Perez (2008) and Perez, Marin and Aleman (2014), who have also argued that resource-based industrialization may be better than other industrialisation strategies (because forward vertical integration requires less reorientation of resources and maybe easier to carry out than other industrial strategies) have emphasized the role of industrial policy in the process of vertical integration. In a similar perspective, chapters 6 and 7, which respectively examine the resource-based development of Chile and Malaysia, show that industrial policy does not only "speed up the unfolding of production linkages" but also *shapes* the direction of production linkages.

The literature on value chain governance within the global commodity chains (GCC) and global value chains (GVC) frameworks is particularly helpful in addressing issues of value addition in commodity sectors. The GCC research agenda emerged in the 1990s to examine the interactions and power relations between 'lead' firms and their suppliers, in order to understand how suppliers in poor countries can 'upgrade' in the value chain (See

Bair, 2005; Brewer, 2011; Gereffi and Korzeniewicz, 1994; Selwyn, 2015).^{25 26}

The emphasis on the role that lead firms play in governing global value chains owes much to the work of Gereffi and his collaborators. Indeed, one of the major contributions of the GCC analysis relates to the governance of the global commodity chains, which puts forwards a range of non-market relationships that influence how material, financial and non-tangible resources flow and are allocated up and down the chain (Gereffi, 1994; Gereffi et al.; 2005).⁷ As a result, lead firms determine what other firms do and how they do it, and thereby influence the upgrading opportunities of suppliers (Selwyn, 2015). Indeed, the ways in which value chains are governed shape the ability of participants to improve their position within it to capture more value (Dolan and Humphrey, 2000; Gereffi, 1999; Gibbon and Ponte, 2005).

Gereffi (1994) initially identified two ways in which lead firm exerted control over a value chain: buyer-driven and producer-driven governance. In the buyer-driven chain, leads firms decide what is produced, where and at what price, while manufacturing little to none of the merchandise sold in their stores or under their labels (ibid.). In the producer-driven chains, a larger percentage of the production process is carried out within the organizational boundaries of the lead firm, while the manufacturing of lower value added components may be subcontracted to suppliers.²⁷

In both instances, leads firms pursue strategies that may reproduce global poverty and inequality, by attempting to monopolize profits within the commodity chain, using their

²⁵ Upgrading is defined as ‘a move to higher value added activities in production, to improve technology, knowledge and skills, and to increase the benefits or profits deriving from participation’ in GCC (Barrientos et al., 2010, 323). Humphrey and Schmitz (2002) identified four types of upgrading in global value chains: 1) process upgrading (e.g. improving efficiency or productivity); 2) product upgrading (e.g. shifting to higher value added products); 3) functional upgrading (e.g. acquiring new capabilities or moving into new ‘links’ in the chain); and 4) inter-chain upgrading (e.g. moving from a global value chain in one industry to another).

²⁶ The GCC framework has its foundations in the world systems theory, and later involved into the global value chains (GVC) and global production network (GPN) frameworks.

²⁷ Later on, a new model of governance was introduced (Dolan and Humphrey, 2000; Werner et al.; 2014). In contrast to the previous dichotomy, the new approach to GVC governance did not merely focus on *who* wields power in a chain, but also examined *how* exchanges are coordinated in the GVC (see Bair, 2005; Gereffi et al., 2005).

institutional power to lobby international institutions and national governments for protection, and intensifying the exploitation of labour and the natural environment across the chain (Selwyn 2015). The ability of lead firms to manage and restrict technology diffusion may allow peripheral firms to maintain a presence in industrial sectors but ‘with lower profit rates and lower wage rates’ (O’Hearn, 1994)

There are two main approaches to the governance dimension of the GVC framework in the academic literature, which lead to different conceptions of the optimal role of the state (Werner et al., 2014). The first approach focuses on power asymmetry and the role of lead firms in reproducing the barriers that protect their positions in the chain. The second approach focuses on the beneficial dynamics of firm coordination, which is the dominant view in the development field and in line with the post-Washington Consensus re-framing of the role of the state as a market enabler correcting for market failures, such as information asymmetry and under-investment in innovation and technology (ibid.). In contrast, the scope for state intervention is much wider if we subscribe to the first approach because public policies have increasingly been acknowledged as a tool to rebalance asymmetric power relations and inequalities within value chains by creating incentives for lead firms to be more transparent, provide suppliers with longer-term contracts, and to participate in knowledge transfer (see Pietrobelli and Staritz, 2018).

As a result of the constraints to upgrading in foreign-dominated GVCs, Lee et al. (2018) put forwards the view that low-income countries must actively participate in GVCs to learn from the outside at the initial stage of growth, but need to reduce their GVC participation or seek separation and independence from foreign-dominated GVCs, if they are to upgrade their economies further.²⁸

We can go even deeper in our conceptualization of the role of the State in shaping production linkages. It is important to start with defining and distinguishing the notion of linkages from the notion of capabilities. Most of the literature on commodities has used the concept of linkages to define many different situations, but it is perhaps useful to take

²⁸ Only at the later stage or after building their own domestic value chains, the latecomer firms and economies may want to re-integrate themselves back into GVCs, but at different and better points in the chain (Lee et al., 2018).

a step back and re-orient discussions of linkage development around the notion of capabilities. It can be argued that linkages are given, while capabilities relate to the ability to exploit such linkages.²⁹ Capabilities thus *restrict* the capacity to utilize linkages. However, we could also talk about the capability to *create* linkages, which is the capability to innovate in the ways that a particular commodity can be used in a different industrial sector (as shown in the case of antimicrobial uses of copper in Chile). Linkages and capabilities are thus endogenous in the long run because they affect each other. In such dynamic approach, capabilities need to be change according to existing (or expected future) linkages in order to *localize* the capacity to exploit such linkages. As a result, when considering which sectors and activities should be targeted as part of resource based development, a key consideration to take into account is which activities can leads to more linkages in the future and which activities enable the accumulation of capabilities for that purpose.

2.4.3 *Horizontal diversification*

A notable issue of academic disagreement regards the scope for state intervention in the horizontal diversification process.

2.4.3.1 *The argument for an ‘enabling environment’ through sector-neutral policies*

The ‘conventional’ argument upheld by neoclassical economists is that governments should not target sectors because they lack the capacity and knowledge to anticipate how these sectors will grow. Such argument leads to the policy advice that governments can

²⁹ As a result, when we talk about “limited linkages”, this should not be a representation of a country’s situation or whether such linkages are met domestically or abroad as much as it is an objective representation of the possible linkages that arise for a certain type of commodity (such as limited fiscal linkages arising out of low value minerals for instance in comparison with energy minerals, see Lebdioui, 2018). In contrast, when a country lacks the capabilities to exploit linkages domestically, it is more accurate to say that linkages are met by imports rather than to say that linkages are non-existent. The linkage-capabilities nexus should also be addressed dynamically rather than statically. Indeed, while linkages are given, they also evolve over time and space through technology innovation, domestic circumstances and practices, etc. For instance, before the technological innovation that led to the creation of lithium batteries throughout the 20th century, the linkage between lithium extraction and electric batteries was non-existent. Capabilities are also not given, and require investments in education but also production experience to allow for learning by doing.

only focus on ensuring an “enabling” environment in which firms can succeed in any given industry, by investing in general capabilities such as health, general education, infrastructure, the business climate, or mechanisms to guarantee general access to credit and property rights for instance (Collier, 2011; Gylfason, 2011). The implicit idea behind this argument is to let the market decide which sectors will grow.

While most economists would agree that policy interventions for sectors have the potential to solve specific bottlenecks, the neoliberal argument is that because said policies entail choosing favourites, they are prone to government failure. This line of argument consequently attributes the inefficiency of resource rents investment to overly interventionist states that promoted too many inefficient infant industries (see Auty, 2004; Nabli et al. 2008). The recommendations are privatization and liberalization.³⁰

2.4.3.2 Active government intervention to target sectors

The growing academic acknowledgement in the past decade of the important role of the state in industrialization has been the result of a better understanding and clear evidence that the best-performing economies featured a proactive role of the state in developing productive capabilities (Commission on Growth and Development, 2008). While sector-neutral policies play an important role for diversification, sector specific policies are likely to be needed to bring down the costs of production, to spur efficiency and to encourage new entry in new sectors (Gelb, 2010; Benavente, 2016). The contribution of the ‘Developmental State’ literature has been of particular importance to the debates on industrial policy, particularly by explaining the rapid growth of a number of East Asian countries in the postwar period.³¹ In a similar perspective, several authors within the

³⁰ Gelb (2010:20) adds that even though resource rents provide government with increased resources to implement vertical policies, the risks are particularly high because having more fiscal resources also reduces the urgency of reversing failing policies. Tordo et al. (2013) further argue that in contrast to vertical policy interventions, horizontal policy interventions appear to be less subject to government failure. Auty (2004) and Nabli et al. (2008) also attribute the insufficient diversification of resource-rich countries in the Middle East and North Africa – where the introduction of new products is very small and what modest diversification has taken place has been due to diversification of existing products (Gourdon, 2010) – to the persistence of ineffective vertical industrial policies that favor well-entrenched groups.

³¹ The concept of the developmental state has been led by several scholars, including Johnson (1982), Amsden (1989), Wade (1990), Chang (1994) and Evans (1995). The developmental state

innovation policy literature have emphasized the crucial role of the state in the introduction of new products and processes (both in the case of products that already exist in foreign markets or radical innovations), which is a crucial mechanism the diversification of a country's production structure (e.g. Benavente, 2016; Lee, 2013; 2019; Mazzucato, 2015).³²

In addition, not all public goods provisions benefit the whole economy, so governments are “doomed to choose” (Hausmann and Rodrik, 2006).³³ Chang (2009) further argued that the only policies that may be called truly “general” are policies regarding basic education and health. “There is selectivity and targeting involved in virtually every industrial policy measure. The only real difference is that of the degree” (ibid:14). As best explained by Ffrench Davis (2002), when policies that first seem “neutral” are applied to different segments of the economy in a context marked by inequalities and heterogeneity in productivity among workers and firms, they may produce asymmetrical effects that are evidently non-neutral, among different productive and social groups. As a result, policy makers should not neglect the asymmetric effects of their sector-neutral interventions.

Two questions arise from the recognition of the need for vertical government intervention in targeting sectors. The first one relates to *how* the government should intervene. The second question relates to *where* the government should intervene: within or beyond ‘comparative advantage’ areas?

literature has essentially offered a heterodox theoretical approach that emphasized the role of government intervention and particular social coalitions featuring some degrees of autonomy of the state from rent-seeking private interests (Haggard, 2018). For broader reviews of the developmental state approach, see Haggard (2018), Henderson (1993), Hope (2019), Leftwich (1995), Moon and Prasad (1997), Öniş (1991), and Routley (2012) and Woo-Cumings (1999).

³² Mazzucato (2015) argues that without state intervention, none of today's innovations would exist (or at least could have taken considerably more time to develop), by pointing out how government support for innovation in now industrialized countries has went far beyond sector neutral public goods provisions but also included aggressive sector specific policies.

³³ For example, exchange rate policies favour (or harm) tradable activities at the expense of nontradable ones; policies targeted at improving financial intermediation by commercial banks are partial to firms in the formal sector that have access to external finance and discriminate against small and informal firms; accelerated depreciation helps capital-intensive activities and discriminates against labor-intensive ones (Rodrik, 2008).

2.4.3.3 How should government intervene to target sectors?

Sector-specific policies can be distinguished according to the degree to which policy intervention takes the form of a public input that is complementary to the market (for example, targeted infrastructure) or the form of a direct intervention to affect market incentives by influencing the behavior of agents (through subsidies for instance) (Crespi et al.; 2014). The first set of policies can be identified as vertical public goods provision (VP) and the other ones as vertical market interventions (VM).

It can be argued that VM policies are often more effective than VP policies in solving market failures because they have less leakages (being more precisely targeted). In contrast, Tordo et al. (2013) argue that VM policies might not be the best option because once subsidies are provided, it is usually difficult for the government to discontinue them, which is why governments should target sectors mainly through VP. However, many more factors should be taken into account regarding the ability of governments to design and implement VM policies. One of them relates to whether governments have plans to scale down support once there are improvements in competitiveness or if the recipient firms become uncompetitive.³⁴ A second key concern is whether the state combines support with performance requirements and monitor and sanctions firms accordingly.

In addition, the historical evidence from several now industrialized countries shows that successful industrial policy went beyond VP measures and included market interventions such as fiscal incentives, subsidies, etc. As a result, it can be argued that what matters the most in terms of industrial policy design is how finely governments target promising sectors, as discussed in the next subsection.

2.4.3.4 Targeting sectors beyond or limited to ‘comparative advantage’?

How to choose sectors to diversify into? Even new approaches in the neoclassical tradition, such the “Growth Identification and Facilitation” (GIF) approach (see Lin and Treichel, 2014), recognize the potential role of the state and are concerned with

³⁴ In that sense, the inability of governments to pick winners needs to be weighed against the ability to cut losses once mistakes have been made (Rodrik, 2004).

identifying the sectors suitable for state intervention according to each country's specificities. However, the GIF approach maintains that state intervention should not defy the country's comparative advantages because government failure occurs when states try to reshape the production structure beyond the boundaries of comparative advantages. Economists such as Lin (2009, 2012), Hausmann and Klinger (2007), Hausmann et al (2010) and Rodrik (2004) argued that government intervention should target industries that are in line with the country's comparative advantages and follow the market rather than try to take the lead.

Interestingly, we can note bifurcations within this tradition regarding what is defined as an area of comparative advantage and how to define relatedness. On the one hand, relatedness has often been associated with vertical integration (activities and sector alongside the commodity value chain) (See Goldthorpe, 2015, Maloney, 2002; Morris et al., 2012).³⁵ On the other hand, the theory of product-relatedness by Hausmann and Klinger (2007) entails a notion of 'relatedness' that differs from the mere existence of production linkages.³⁶ This theory is based on the idea that every product requires capabilities (knowledge, physical assets, intermediate inputs, labour-training requirements, infrastructure needs, property rights, regulatory requirements and so on) that are highly specific to that activity and sector (Hausmann and Klinger, 2007). If two goods need the same capabilities, a country that has a comparative advantage in one is

³⁵ This argument is based on the idea that governments should implement policies that build on the comparative advantage of abundant natural resources by creating groups of high-tech manufacturing industries that utilize domestically produced raw materials. For instance, Maloney (2002) compared the development strategy of resource-rich countries in Latin America to the cases of Australia, Scandinavian countries, and the United States and argued that the reason why Latin American countries underperformed is because they pursued an import substitution policy while the other countries emphasized the comparative advantage of their resource sector and diversified around it.

³⁶ The application of such theory, the Product Space (PS), was first presented in Hausmann and Klinger (2007) and Hidalgo et al. (2007) as a network of relatedness between 774 globally produced and exported products. According to the PS, some products are very near one another and others are far apart and countries should change their exports structure by moving to new export activities that are near their current activities. The PS aims to identify what new products a country might be expected to be able to export with relative ease. Hidalgo et al. (2007) attempted to map this product space empirically by measuring the distance between two products based on the probability that if a country exports one product, it exports the other. The PS framework argues that defying the comparative advantage has a high probability of failure.

likely to have a comparative advantage in the other. There are many issues and limitations to this argument, most of which cannot be addressed within the scope of this chapter.³⁷ The main point to highlight here is that Hausmann's and Klinger's understanding of relatedness is very different from the notion of relatedness through production linkages. Hausmann et al. (2010) even note that looking downstream from existing production is a very poor guide to identifying high-potential export sectors.

Coniglio et al. (2018) investigates whether the patterns of diversification of a sample of 177 countries over the period 1995-2015 conform to the prediction of the PS framework. They find that a significant number of new products that entered countries' export baskets were unrelated to the initial productive specialization (suggesting path-defying diversification rather than path-dependent diversification), and that path-defying diversification is associated with higher economic growth (also see Pinheiro et al., 2018).

Those findings support the argument in Chang (2013) that many countries have industrialized successfully by developing capabilities and learning-by-doing in sectors in which they did not have comparative advantage (such as the automobile industry in Japan). Pack and Saggi (2006) and Succar (1987) also argued that allocating resources according to comparative advantage can only ensure static efficiency and in no way guarantees dynamic efficiency, thereby ignoring the links between present choices and future production possibilities. While emphasis is placed by neoclassical economists on the importance of specialization based on existing comparative advantages, the developmentalist tradition and evolutionary economics offer a more comprehensive analysis of productive that take into account the role of learning, technological upgrading and capabilities. In contrast to static approaches to comparative advantage, dynamic approaches feature a wider scope for the role of the state, responsible for shaping

³⁷While the product space theory has attempted to link micro-learning dynamics and macro-transformative effects, it does not disentangle the different forms of learning realized at the firm level and therefore cannot explain how learning dynamics trigger structural change (Andreoni, 2014). Andreoni (2014) offers a more convincing analysis of structural learning processes that are embedded in productive structures; the interconnectedness among components of production processes; and how different organisations may exploit technological linkages with dissimilar activities towards the selective creation of new productive opportunities. This view is more in line with the concept of relatedness as defined in section 2.3, whereby related diversification consists in leveraging transversal capabilities that arise out of the commodity value chains.

productive transformation away from ‘low-quality activities’, characterized by diminishing returns, flat learning, low productivity and wages, towards ‘high-quality activities’ that are characterized by economies of scale, technological upgrading, high productivity and wages (Cimoli et al., 2009; Findlay, 1973; Kuan, 2016; Nurske, 1961. For the context of oil exporters, see Cherif and Hasanov, 2014). Thus seen, rather than accepting that countries have gotten where they are by exploiting their existing comparative advantages, the key question we should ask is how they have developed new capabilities and acquired new comparative advantages (Diestche, 2018).³⁸

2.4.4 Managing fiscal revenues from resource extraction

This section addresses how governments should utilize fiscal linkages arising out of commodities. The past decade has witnessed a growing literature on the appropriation, management, distribution, spending and investment of natural resource revenues. Chang (2007) offers a useful framework of natural resources management that can help us structure the literature on the subject. As he explains, natural resource revenue management is twofold: it involves the appropriation of natural resources rents as well as their investment across financial assets, general capability building, related diversification, or unrelated diversification. The appropriation and taxation issue is not the key focus on this research, as it has already been investigated widely (see Conrad, 2012; Humphreys et al., 2007; Lebdioui, 2017). The area where further research needs to be pursued is the last one in the natural resource revenues management policy chain developed by Chang (2007): investing rents for diversification.

As previously mentioned, Hirschman (1981) argued that fiscal linkages tend to be limited in their impact on industrial development because they provide no guidance as to which sectors the rents should be invested in. In addition, while natural resource wealth generates opportunities to fuel economic development, resource-dependent countries face particular macroeconomic challenges associated with commodity price boom-and-bust cycles. It is often considered that resource-dependent countries overspend when

³⁸ Chapter 8 and 9 of this thesis examine the underlying dynamics behind the emergence of new products in the respective export baskets of Chile Malaysia since the 1960s.

commodity prices and revenues are high and cut back spending when commodity prices decline, which affects the quality of public spending and generates macroeconomic volatility (Collier et al. 2010). Governments must also manage their resource rents in such way as to avoid spending in excess of the economy's absorptive capacity.

Against this backdrop, how and where resource revenues should be invested remains the source of contentious academic and policy debates. Such debates have focused on whether resource revenues should be saved overseas or invested at home (see Bauer, 2015; Gelb et al. 2014a; OECD, 2018a; Van der Ploeg and Venables, 2018; Witter and Jakobsen, 2018); invested through a wealth fund, through the general budget, or by increasing in reserves at the central bank (Mohaddes and Raissi, 2017; Van der Ploeg and Venables, 2018); consumed or invested (See Berg et al, 2012; Cherif and Hasanov, 2014; Hartwick, 1978; Henstridge and Roe, 2018); earmarked or not (see OECD, 2016a).

Such debates have been dominated by neoclassical approaches to resource revenue management (based on the permanent income hypothesis), which are characterized by an emphasis on consumption and on short-term equilibrium (through the objective of fiscal stabilization). As a result, the mainstream view within the resource revenue management literature has been that government should not invest resource revenues for domestic diversification but instead in financial assets to allow for fiscal stabilization. This strategy has been labeled as 'financial diversification' in section 3.

However, a few counter-arguments can be provided. Firstly, current approaches focus on solving symptomatic features of the resource curse (such as commodity price volatility) but do not address the root causes that causes vulnerability to commodity price fluctuations, namely the lack of a diversified productive structure. This is what Reinert (2007:240) refers to as 'palliative economics'. Instead of attacking the sources of resource dependence from the inside through the production system – which is what development economics used to be about – the symptoms are addressed by throwing money into financial assets abroad for fiscal stabilization. While resource revenues constitute a potentially productive form of capital if invested in productive capacity building (Stiglitz, 2003), an excessive focus on fiscal stabilization, though it helps

address short-term fluctuations, can be detrimental to long-term development if it delays the transformation of the economy. As Chang (2007) explains, financial investments are unlikely to enhance the productive capabilities of the national economy. The standard policy advice for managing resource revenues could also be a way to ‘kick away the ladder’, because as the rest of this thesis shows, now-diversified resource-rich economies such as Chile and Malaysia have not diversified by following the standard policy advice.

How exactly can resource revenues be invested to promote diversification in developing countries that suffer from commodity dependence? Insights from the structuralist school (and in particular the works of Arthur Lewis, Michal Kalecki, and Raul Prebisch amongst others) are very useful here. The structuralist school has emphasized the importance of the shift from commodity to industry. The Prebisch-Singer hypothesis suggests that the price of primary goods declines in proportion to manufactured goods over the long run, which calls for the industrialization of resource-dependent countries. This is caused by differences in income elasticity of demand between manufactured goods and commodities, and declining terms of trade (Prebisch, 1950). By focusing on the agricultural sector, scholars such as Bhaduri and Skarstein (1997); Kalecki (1976); Kay (2002), Mellor (1973) and Mundle (1985) further analyzed the re-investment of fiscal surplus squeezed from agriculture towards increasing agricultural productivity and industry.^{39 40} By applying those insights to the extractive sectors, we can reframe debates of resource revenue management within the broader context of financing development and initial capital accumulation in developing countries. Most of the modern literature on managing extractive resource revenues is not oriented towards the productive economic transformation of resource rich developing economies. Chapter 4 attempts to fill this gap.

³⁹ The rest of Kalecki’s arguments underlying such shift (in terms of food shortage, inflation, and elasticity of demand for labour in agriculture) only apply to the case of soft commodities but do not apply to mineral resource extraction, which are characterized by a low labour intensity and cannot be used to address food shortages.

⁴⁰ These scholars have emphasized the intersectoral relationship between agriculture and industry as a key explanation for differences in the development performance between regions, particularly between Latin America and East Asia.

2.5 CONCLUDING REMARKS

This critical literature review has focused on several dimensions of the relationship between mineral resources and economic development. First, this literature review has shown that the literature is slowly moving away from resource determinism and towards acknowledging that mineral resource abundance is not inherently a curse nor a blessing. In the quest to shed light on the need for alternative explanations for variations of development across resource-rich countries, the role of industrial policy to promote diversification is of particular concern.

Second, this chapter has reviewed and adapted various linkage arguments in order to develop a taxonomy of diversification strategies. It subsequently has turned toward the role of industrial policy in the context of the three diversification strategies outlined. It appears that the literature calling for a limited role of state intervention in the various diversification processes reflect the dominance of a state-market dichotomy that presents the state and market as being in opposition with one another, with limited attention to the complex interlinkages between them that shape development processes and outcomes (Ikpe, 2018).

In that context, this thesis is going to explore the numerous contextual determinants that influence the desirability and suitability of certain diversification strategies over others, as well as evidence of the role of industrial policy in not only *unfolding* but in *shaping* the linkages around commodities.

Chapter 3:

Towards a new approach to measuring resource abundance

3.1 INTRODUCTION

The discourse around extractives-based development has tended to group various countries together, considering them all to be ‘resource rich’, which makes little sense. This chapter highlights important distinctions amongst resource-rich economies, which have great implications for the suitability of different resource-based development strategies. This chapter starts by defining resource abundance and clarifying certain statistical misconception when measuring natural resource abundance (and dependence). Most of the literature on natural resources and development has looked different indicators of resource abundance in isolation to each other. Such approach can be quite problematic and has often even led to a conflation between resource abundance and resource dependence and statistical misconceptions stemming from the wrong classification of resource poor countries as resource rich countries and vice versa.

After examining different ways to measure natural resource abundance and their implications, this chapter calls for a multidimensional approach to measuring resource endowment because harnessing natural resources for development is multi-level process. A new measurement of resource abundance, the MINDEX, is introduced. It responds to the call by several scholars for a new measure of extractive dependence and economic diversification over time in order to indicate whether a country is moving in the wrong direction (see Lahn and Stevens 2018; Mitchell and Stevens, 2008; Stevens et al. 2015).

3.2 DEFINING AND MEASURING RESOURCE ABUNDANCE

3.2.1 Defining and classifying natural resources

The first important issue to clarify concerns the differences between different types of

natural resources and what I will mean by ‘natural resources’ in this study.

We tend to distinguish mineral wealth from other types of natural resources because of particular political economic circumstances. Indeed, mineral resources tend to generate ‘point’ resources, which exhibit concentrated and capturable revenue patterns, rather than ‘diffuse’ resources such as revenues from agriculture. Point rents are usually relatively capital intensive and tend to be associated with enclave industries since they generate fewer production and consumption linkages in poor economies than more ‘diffuse’ resources (Hirschman, 1981; Auty and Gelb, 2000:141). Hard and energy commodities such as oil and gas are typical examples of natural resources that are considered to generate ‘point’ rents. However, there are exceptions. Artisanal and small-scale mining tend to generate diffuse resources, while agricultural resources can be concentrated through state marketing board, cooperatives, large buyer-companies.⁴¹

In terms of fiscal linkages accruing to the government, it is true that hard and energy minerals tend to have much higher value in international commodity markets than most soft commodities, but there are some exceptions such as low value minerals (e.g. industrial minerals such as limestone, gypsum, silica sand) or saffron (which has a higher commercial value than gold per kg).

While it can be perceived that commodity price volatility tends to be more accentuated for mineral commodities than agricultural commodities, it can be argued that soft commodity price volatility is further affected by climatic uncertainties, pathogens and other risks associated with farming, which do not necessarily affect hard and energy minerals. In reality, both agricultural and mineral exhibit outbreaks of volatility (OECD, 2012). As a result, I am not taking these points into consideration.

There are other stronger reasons for singling out mineral resources. The most significant difference lies in the fact that mineral commodities are non-renewable while soft commodities are renewable. This difference leads to different dynamics and challenges in terms of managing those industries on the long run. The second most important

⁴¹ Bernstein (2010) outlines the obstacles to capitalist farming and why large corporations have tended to leave farming to “family farmers” but it can be argued that this not the case anymore.

difference lies in the fact that soft commodities (agriculture, fisheries, etc) can be man-induced. In contrast, mineral commodities are by definition “indigenous” and thus “natural”. This is why measuring general natural resource abundance in Chile or Malaysia for instance would neglect the fact that the palm oil, rubber, salmon and forestry sectors have been the result of government-induced diversification. The focus on mineral resource abundance is thus justified for these two reasons.⁴²

3.2.2 Defining abundance and dependence

The second issue relates to finding accurate ways of measuring ‘resource richness’ and distinguishing resource abundance from resource dependence. Both resource abundance and resource dependence are subjective concepts that are difficult to measure. As Davis (2010:10) puts forward, “one approach is to infer endowments from a country’s revealed comparative advantage [...] The more direct approach is to measure physical endowments, i.e., mineral resource stocks, directly”.

Several influential studies on the resource curse have been characterized by statistical misconceptions. For instance, the negative correlation between economic growth and natural resource wealth found in Sachs and Warner (1997) relies on measurements of the share of resources output/exports out of total output/exports. This measurement can be misleading because it reflects resource dependence rather than resource abundance. First, it misclassifies resource poor countries that export nothing else than commodities because they have little other products to export to foreign markets (which is a key characteristic of an underdeveloped economy) as ‘resource wealthy’. Indeed, some countries, such as Chad and Mali, may have few mineral resources but yet depend on those few for the bulk of their export earnings (Gylfason, 2011:10). Second, the statistical confusion between resource dependence and abundance leads to a selection bias that ignores successful resource-based development experiences. In historical terms, several now-industrialized resource rich countries, such as the United States, Canada, Australia, Sweden, the Netherlands and Malaysia, began as resource-based economies but have

⁴² The first three reasons also offer some insights on the potential differences between renewable and non-renewable commodities but they can be more easily dismissed given that they are based on generalizations (or observations) rather than clear-cut differences.

managed to diversify their economy and by definition do not qualify as ‘resource dependent’ anymore.

A country is commonly considered as resource-dependent when natural resources constitute the bulk of this country’s export basket or government revenues. However, should we distinguish mono-resource exporters from countries that depend on several types of natural resources? Should multi-resource abundant countries, such as Chile or South Africa for instance, also be classified as resource-dependent? How should resource abundance be measured? Gylfason (2011:10) provides an interesting way of distinguishing resource abundance from resource dependence. According to him, abundance relates to the amount of natural capital that a country has at its disposal: mineral deposits, oil fields, forests or farm land, while dependence relates to the extent to which the nation in question depends on these natural resources for its livelihood (ibid.). Nevertheless, the distinction between abundance and dependence should perhaps be subtler than the difference between resource availability and resource exploitation. Indeed, natural capital may be exploited through economic activities that communities may rely on in order to subsist, without being fully dependent on natural capital alone. For instance, resource activities can constitute the core of resource-based manufacturing activities that contribute to diversify economic output.

Lederman and Maloney (2007) measured resource abundance by using *net resource exports per capita* and concluded that Norway, New Zealand, Canada, Finland and Australia ranked as the most resource intensive economies rather than economies such as the DRC and Papua New Guinea in the Sachs and Warner’s (1995) study. This measurement is indeed a much better reflection of resource abundance than the share of natural resources in GDP/exports.

It is also possible to look at indicators other than exports. For instance, resource abundance could also be measured in terms of the value of production (see Leamer, 1984; Moroney, 1975); the size of resource revenues (see IMF, 2012b; Matsen and Torvik, 2005); or resource rents (see Cammett et al., 2015; Bond and Fajgenbaum, 2014; Collier and Hoeffler, 2009; Chauvet and Collier, 2008; IMF, 2012b). However, measurement

that focus on resource rents or revenues may misclassify countries with large mining sectors such as Madagascar (ilmenite) as resource poor because of a very low resource rent of the commodity (the market price of ilmenite is only marginally above its cost of extraction in Madagascar) (Bond and Fajgenbaum, 2014:126). In those cases, focusing on resource rents may misrepresent the importance of extractive sectors for the domestic economy.

In contrast to studies that have focused on measured of resource exports/production/rents, geologists do not think of endowments as the value of current production and tend to focus on geological abundance as well as quality, location, and technical considerations such as extractability of metal from ore (Davis, 2010). The United Nations even has its own definitions that distinguish resource reserves from resource deposits. Reserves are quantities that are relatively more certain geologically and more likely to be economic to extract, while resources are less geologically certain and may never be economically extracted.⁴³ Some studies have measured resource abundance by using indicators of physical resource endowment, by comparing resource reserves or deposits per square kilometre across regions (See Collier 2011; Arezki et al., 2016).

Many indicators have been used to measure resource abundance (proven reserves, size of production, exports, resource rents, or government resource revenues) in both absolute terms and relative terms (as share of GDP or total exports for instance). However, existing measurements have mostly relied on such indicators in isolation to one another. There is no objective all-encompassing single measurement for resource abundance, which is why it is important to look at several indicators. In addition, there are great implications of relying on one measurement over another. Harnessing natural resources for development is multi-level process and the types of variables that we choose to measure resource abundance reflect different aspects of the natural resource management chain. As shown in section 3.3, highlighting several indicators simultaneously may be a useful way to identify specific developmental challenges a resource-rich country faces.

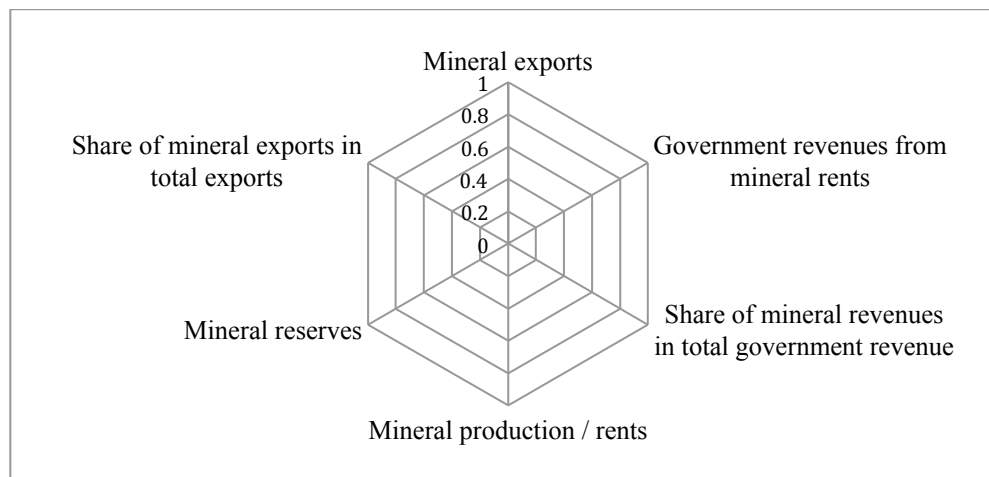
⁴³ However, there is no standardization of these categorizations, with several mineral-producing nations deriving their own definitions (e.g., JORC in Australia, CIMVal in Canada, SAMVal in South Africa, and SME in the United States) (Davis, 2010).

3.3 RESOURCE ABUNDANCE COMES IN SEVERAL SHAPES: INTRODUCING THE MINDEX

3.3.1 Overview

The combination of several indicators of resource abundance (such as resource production, exports, rents and government revenues) can offer useful insights that single indicators cannot grasp on their own. In fact, this method not only sheds light on the implications of choosing indicators over others when measuring resource abundance and dependence, but also holds potential to be used as the basis of a “diagnostic” tool, in order to identify the policy challenges that a given country might face.

Figure 3: Weighting different indicators of resource abundance/dependence



This multidimensional indicator for extractives-based development (MINDEX) consists in weighting six different indicators of resource abundance and resource dependence. These indicators represent different dimensions of extractive activities. Some indicators (such as government extractive revenues) relate to the fiscal linkages arising out of commodities, while others relate to resource reserves (and resource exhaustibility), resource exports and resource rents.⁴⁴ Those six indicators reflect the several steps of the

⁴⁴ Resource rents are defined as unit price minus the cost of production times the quantity produced (World Bank, 2019). In other words, commodity rents are the difference between the value of commodity production at world prices and total costs of production.

resource revenue management policy chain to translate extracted commodities into developmental assets. Such steps are common across various policy frameworks of natural resource management (see table 1 below).

Table 1: Comparing frameworks of the resource revenue management policy chain

<i>Series of steps</i>	Chang (2017)	Collier & Laroche (2015)	EITI	Henstridge & Roe (2018)	NRGI (2014)
Discovery	Discovering			Discovery (Exploration)	Discovery and deciding to extract
Exploitation and production	Exploiting		Awards of contracts and licences; Regulation and monitoring of operations	Development (Investment and construction) Production (Monetization)	Getting a good deal
Resource rents appropriation	Appropriating the rents	Taxing	Collection of taxes and royalties	Revenue (Transfer rent)	Getting a good deal
Investment of resource revenues	Investing the rents across financial assets, general capacity building, and for diversification.	Investing in investing Investing	Resource revenue management and allocation Social and economic spending	Public Investment Human Development	Managing revenues Investing for sustainable development.

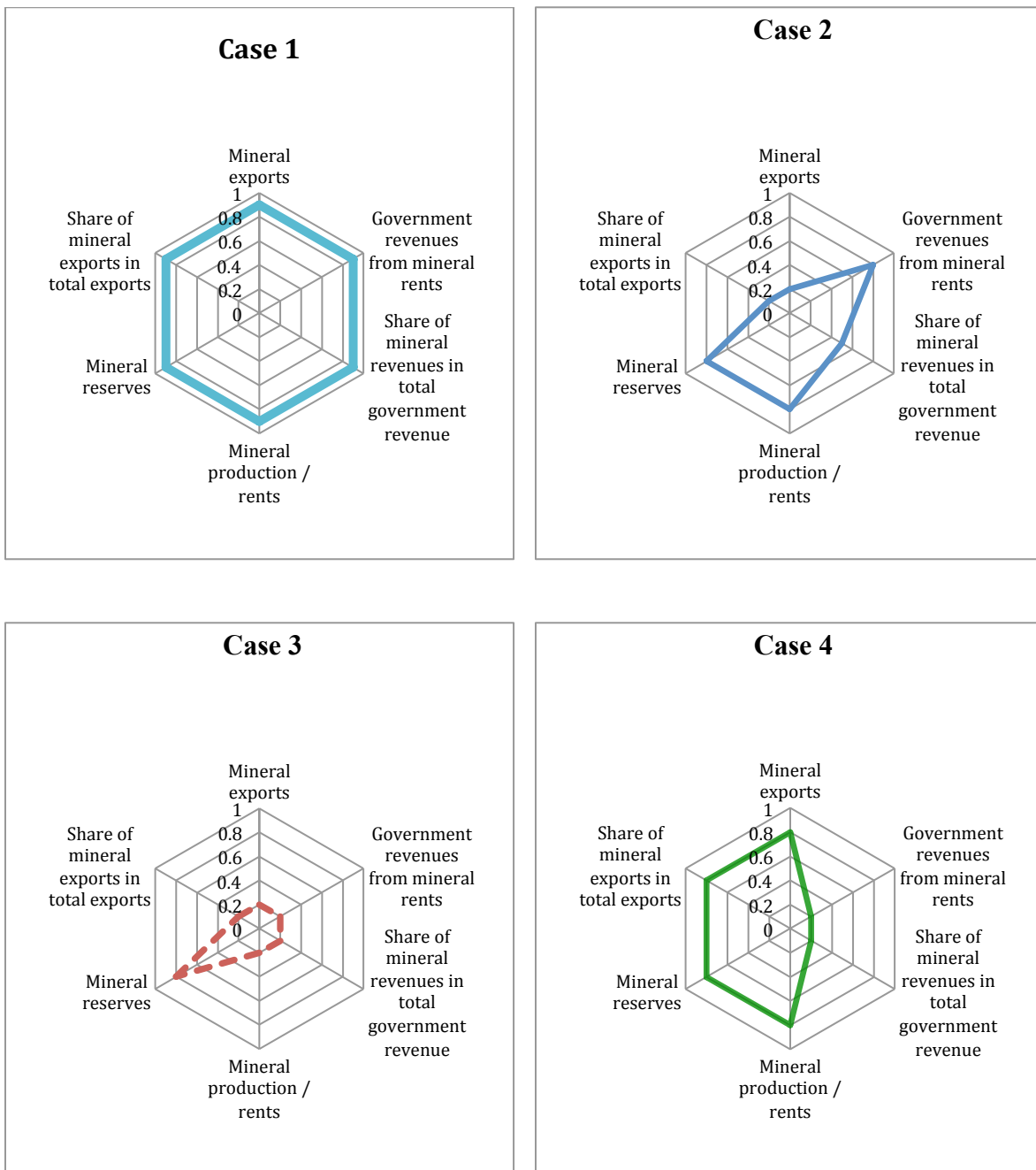
These frameworks have a common message: the conversion of extractive resources into developmental outcomes follows a sequence of steps, which includes the discovery of natural resources, their production, the appropriation of extractives revenues, and the investment of such revenues for developmental purposes. As such, the MINDEX can serve as a diagnostic tool to assess the performance of a country on each of those steps (whether it is limited production compared to proven reserves, poor appropriation of revenues, or an insufficiently diversified economy reflecting the poor investments of resource revenues for structural transformation). An indicator of developmental outcomes (such as the HDI or GDP per capita) may be added in future updates of the MINDEX in order to consider the last step of the resource revenue management chain, which is investing for human development (or economic growth).

3.3.2 Seven different scenarios

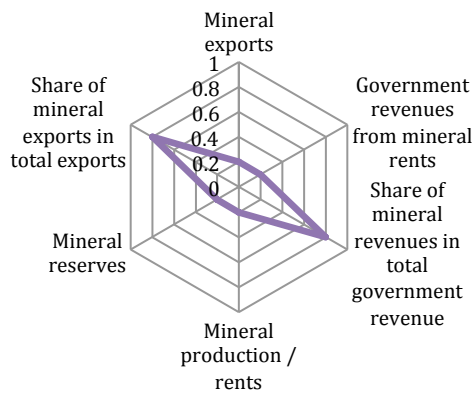
Table 2: Seven case scenarios

<i>Case</i>	<i>Scenario</i>	<i>Explanations and policy challenges</i>
<i>Case 1</i>	All six indicators are high	The country is both resource-abundant and resource-dependent.
<i>Case 2</i>	Resource production is high but exports are low	High domestic consumption of that mineral as a finished product (consumption of oil for electricity generation in Saudi Arabia) or as inputs for value added activities (e.g. oil used for petrochemical production in the United States) or illegal smuggling of commodities (e.g. DRC & Burkina Faso).
<i>Case 3</i>	Resource reserves are high but production/rents are low	Issue of investment attractiveness in resource activities (due to a poor business climate); limited domestic infrastructure and capabilities to extract minerals; political issues such as an embargo (as in oil-rich Iran and manganese-rich Cuba); or local conflict (e.g. Libya) restraining resource production and exports.
<i>Case 4</i>	High level of resource production (or resource rents) but low government resource revenues	The country faces issues of appropriation of resource revenues and possible insufficient taxation on mineral production/exports.
<i>Case 5</i>	Resource production, exports and reserves are low but the share of minerals in total exports and government revenues are high.	The country is resource poor but is highly resource dependent
<i>Case 6</i>	In contrast to case 4, mineral production, exports and reserves are high but the share of minerals in total exports and government revenues are low	The country is resource rich but has a diversified economy.
<i>Case 7</i>	Mineral exports (in absolute terms) are very high, but mineral production and reserves are low.	The country is resource poor but is a re-exporter of commodities after some degrees of processing (India and Israel with diamonds exports, Switzerland with gold exports, Belgium, Singapore and South Korea with fuel exports).

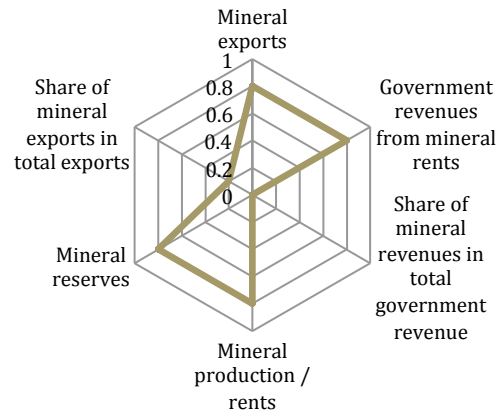
Figure 4: Seven shapes of “resource abundance”



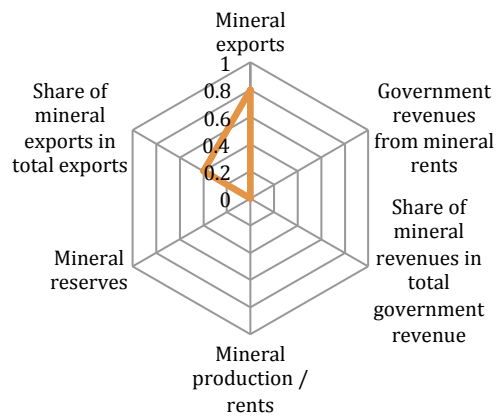
Case 5



Case 6



Case 7



3.3.3 *Methodology*

Developing and applying this tool has proven difficult due to several methodological reasons. Firstly, data is not always available for each of those indicators for each country. In particular, sources of government revenues are not systematically revealed. Secondly, there is an issue of data comparability. For instance, data on the mineral deposits by country is often expressed in weight but rarely in value, which renders difficult the task of comparing countries that export different types of mineral resources. A third difficulty lies in the development of an appropriate scoring system for each indicator, which necessitates benchmarks. Table 3 below summarizes the scoring criteria for each indicators of the MINDEX. The value of extractives exports, rents, reserves and government extractives revenues are expressed in USD and in per capita terms. Per capita measurements are a better reflection of resource abundance than national measurements. The fact that two countries are sitting on/producing/exporting the same volume of minerals does not mean that they are equally resource ‘rich’, as their resulting wealth will depend on the cost of extraction but also on how many people will share the benefits of such wealth (Lahn and Stevens, 2018).⁴⁵

The methodological choices underlying this scoring system are further explained in subsequent paragraphs. Such methodology might be imperfect for many reasons, but it may be the best effort so far to capture the multidimensionality of resource abundance, until more data becomes accessible to improve the current methodology.

⁴⁵ Indeed, it can be argued that it makes little sense to consider that a country such as Nigeria is more resource-rich than Norway based on the national value of resource rents generated on a given year, because such rents have to be shared between 190million people in Nigeria and only five million in Norway. By adjusting resource rents to population size, Norway’s resource rents per capita in 2016 are 40 times higher than Nigeria’s!

Table 3: Underlying scoring criteria of the MINDEX

Score	Share of extractives in exports/ government revenues	Value of extractives exports <i>(USD per capita)</i>	Value of extractives rents <i>(USD per capita)</i>	Value of extractives reserves <i>(USD per capita)</i>	Government extractives revenues <i>(USD per capita)</i>
1	100%	> 10,000	> 5000	> 100,000	> 3000
0.9	90%	Between 7,500 and 10,000	Between 3750 and 5000	Between 100,000 and 75,000	Between 3000 and 2250
0.8	80%	Between 5,000 and 7500	Between 2500 and 3750	Between 75,0000 and 50,000	Between 2250 and 1500
0.7	70%	Between 2,500 and 5000	Between 1250 and 2500	Between 50,000 and 25,000	Between 1500 and 750
0.6	60%	Between 1000 and 2500	Between 500 and 1250	Between 25,000 and 10,000	Between 750 and 300
0.5	50%	Between 750 and 1000	Between 375 and 500	Between 10,000 and 5,000	Between 300 and 225
0.4	40%	Between 500 and 750	Between 250 and 375	Between 5,000 and 2,500	Between 225 and 150
0.3	30%	Between 250 and 500	Between 125 and 250	Between 2,500 and 1,000	Between 150 and 75
0.2	20%	Between 100 and 250	Between 50 and 125	Between 1,000 and 500	Between 75 and 30
0.1	10%	Between 50 and 100	Between 25 and 50	Between 500 and 100	Between 30 and 15
0.0	0%	<50	< 25	Below 100	< 15

3.3.3.1 Resource reserves

Measuring and comparing resource reserves has been a difficult task because of data heterogeneous availability across country across types of commodities. Indeed, commodity reserve data, when accessible, tends to be measured in weight (metric ton, ounce, barrels, or else) rather than value. However, an ounce of gold does not have the same value as an ounce of limestone. What is more, because the other indicators (such as resource exports, rents, revenues) are measured by value, it is important for commodity reserve to be expressed in USD to allow for comparability across indicators. Another important consideration lies in the difficulty of distinguishing resources deposits from resources reserves that are more difficult to extract.

After considering several options, I have chosen to convert data on commodity reserves that was expressed by weight in USD, based on averaged commodity prices for a given

time period.⁴⁶ Three further options can be pursued. One option is to recalculate commodity prices for every given year, but one limitations would be that fluctuations in the commodity reserves score may be wrongly interpreted as changes in commodity reserves as opposed to reflect commodity price fluctuations. Another option is to calculate the value of commodity reserves based on the commodity prices in a reference year and apply it to all years. However, given commodity price fluctuations, such method may not be an accurate reflection of the value of a commodity over time. A third option (the one I have chosen) is to calculate average commodity prices for a longer time period, which includes periods of both commodity booms and bust (such as 1990-2016).⁴⁷

Table 4: Selected commodity prices

Commodity	Average prices (1990-2016)
Oil (brent)	USD 46,70 per barrel
Natural gas	USD 3.82 per mmbtu = USD 135 per 1000 m3*
Gold	USD 641.242 per ounce
Copper	USD 4,043.03 per metric ton
Zinc	1,548.07 per metric ton
Cobalt	43,850 per metric ton

Sources: EIA, 2018; IMF (2018b), IndexMundi, 2018a, 2018b; OnlyGold, 2018

*Conversion using 1 MMBtu = 28.263682 m³ of natural gas

3.3.3.2 Share of minerals in total exports and revenues

Scoring the share of mineral resources in total exports and resource revenues in total government revenues has been relatively straightforward given that these two indicators are expressed as a percentage.

⁴⁶ Another option is to rank countries according to the share of global commodity reserves that they hold. However, such measurement does not consider the different monetary values across different commodities. The world's top holder of limestone reserves is arguably not as "resource-rich" in value terms as the 10th largest holder of oil reserves.

⁴⁷ One limitation is that this option would not accurately reflect the current value of commodities such as cobalt or lithium, whose price has been steadily rising and is expected to further increase given the rising global demand for these products. However, this method is justified by the fact that most other commodities have featured fluctuating prices over the last two decades.

3.3.3.3 Mineral resource exports and rents

Resource exports and rents could be scored in either absolute terms or relative terms. Both options offer advantages and disadvantages. Here, absolute values have been chosen because they are more sensitive to commodity price volatility and may be a better reflection of a country's level of resource exports/rents at a given time.⁴⁸

The benchmarks should also differ between resource rents and resource exports, based on the average ratio between resource rents and resource exports across countries and time. Based on my calculations for the top 25 resource exporters, resource exports are on average twice (2.01) as high as resource rents over the period 1997-2010. The scoring criteria (see table 3) for resource rents and exports take this ratio into account.

3.3.3.4 Government revenues

Data availability has always been an issue when measuring government resource revenues (Prichard et al. 2018). However, the most recent database of the International Centre for Tax and Development (ICTD) has now included measures of resource revenues specifically, which captures both taxes from resource revenues, as well as non-tax resource revenues (such as royalties, dividends, etc). Nevertheless, data is still missing for several countries and time periods.

In the ICTD database, tax revenues are expressed as a percentage of GDP. To obtain absolute values per capita, I have converted such values by multiplying them by the corresponding GDP per capita (in constant USD) for each country. Measurements of real GDP (in constant 2010 USD) were used over nominal GDP in order to remove the effects of inflation over time, and focus solely on production volume and commodity prices. The choice of real prices over nominal prices indeed enables better comparisons over time.

⁴⁸ In contrast, relative values (through country rankings) enable to compare a country's situation to other countries but do not take into account commodity price volatility. Indeed, a resource exporter might still belong to the top decile even if resource revenues drop following a commodity price bust. In addition, the distribution of countries according to the level of resource exports or rents is not necessarily homogeneous, which increases the likelihood of misclassifying countries. The option chosen thus relies on absolute rather than relative values.

One other issue is to define what counts as government revenues. Should profits that are retained by SOEs (such as national oil companies) be taken into account? For instance, many SOEs have more than purely commercial missions but also spend their revenues for social purposes (such as spending on fuel subsidies by Petronas, etc).⁴⁹ Because of the lack of data on SOEs profits and spending patterns, it would be too difficult to include SOEs in the analysis, which consequently only focuses on government revenues.

Another key concern is to distinguish federal revenues from subnational revenues. In some countries (such as the USA or Malaysia) resource revenues do not only accrue to the central government but also to provincial governments. As a result, it may appear that US government resource revenues are low, when in fact most resource revenues accrue to state governments. The ICTD database only includes revenues to the central government. Future updates of the MINDEX will attempt to include subnational revenues.

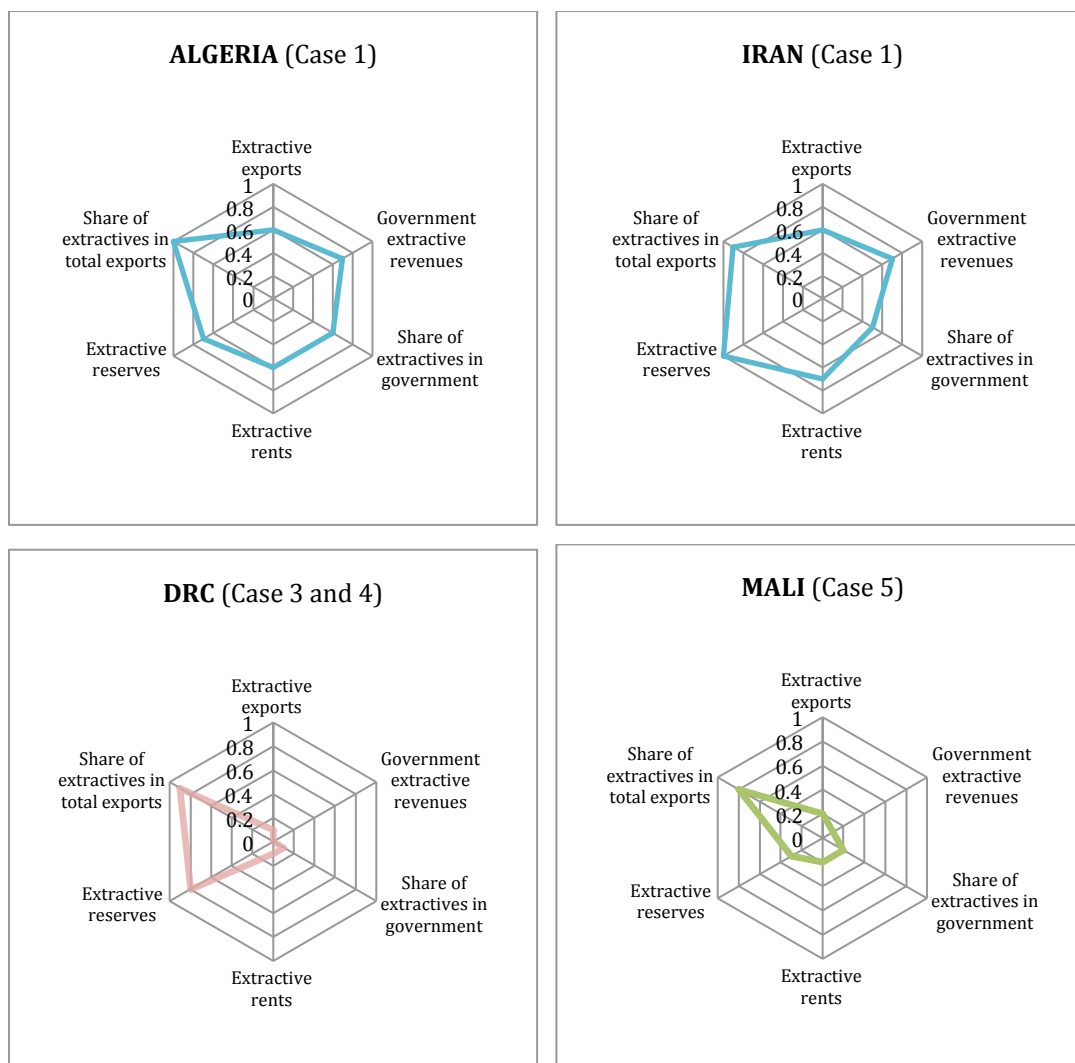
The lack of data on government fiscal revenues for many countries renders international comparisons a difficult task. As a result, how can we determine whether a government's resource revenues are high or low? Here, the solution found consists in using resource rents values as a baseline. Evidence suggests that on average, governments should reasonably capture two thirds of resource rents. While fiscal regimes for extractive industries vary greatly, the IMF (2012a) finds that government should retain around 40–60% of rents in the mining sector and around 65–85%. Fiscal regimes that raise less than these benchmark averages may be cause for concern or regret (*ibid.*). It is consequently reasonable to assume that across extractive activities, government should receive about 60% of the value of resource rents, which is why I have imposed threshold values based on a government resource revenues/ resource rents ratio of 0.6. While this method suffers from limitations due to the variety of fiscal regimes across different types of extractive sectors, it is useful as it enables to directly compare government resource revenues with resource rents for the same year.

⁴⁹ Interestingly, countries where private firms dominate oil production appear among the world's top tax collectors, while similarly resource-rich countries that rely on national petroleum companies appear among the worst tax collectors (Pritchard et al, 2018).

3.3.4 Results⁵⁰

3.3.4.1 Cross-country analysis

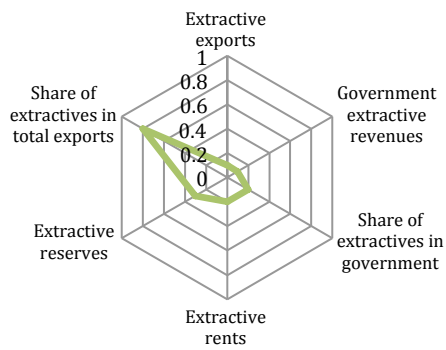
Figure 5: Application of the MINDEX to selected countries (year 2010).⁵¹



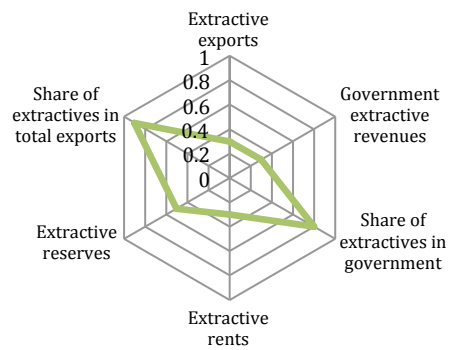
⁵⁰ See Appendix A for details on each country data and measurements.

⁵¹ With the exception of Burkina Faso, for which data corresponds to the year 2016.

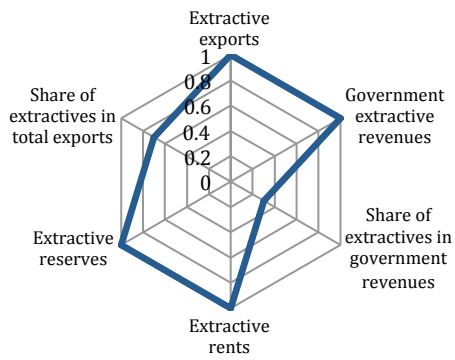
BURKINA FASO (Case 5)



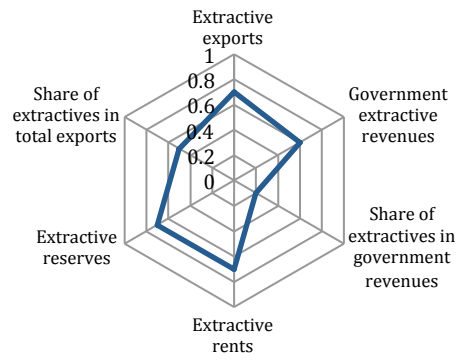
CHAD (Case 5)



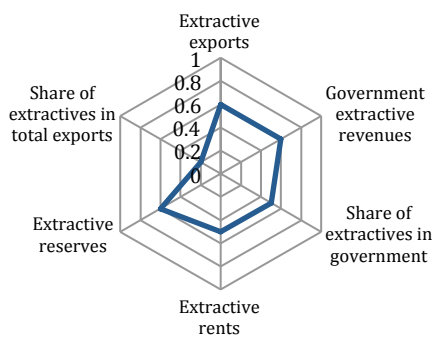
NORWAY (Between case 1 & case 6)



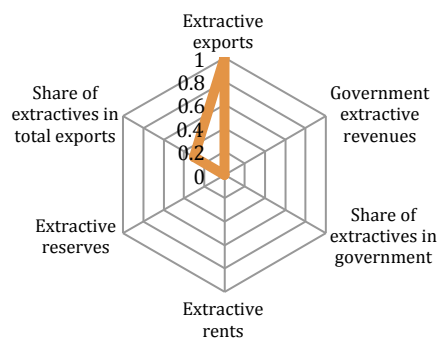
CHILE (Between Case 1 and Case 6)



MALAYSIA (Case 6)



SINGAPORE (Case 7)



Several key observations can be drawn from figure 5. First, it is possible to identify each country with one of the seven cases identified earlier in this document. Some of the cases are hybrid because they simultaneously feature several case scenarios (DRC) while other cases are hybrids because they are in the transition between two cases (Norway).

Burkina Faso features a case 5, due to the small size of government resource revenues and resource exports despite the dependence on mining exports. The case of Burkina Faso is confirmed by current analyses. For instance, EITI (2016) reports that:

“The declared production from artisanal mining was 0.5 tons in 2013, but undeclared production was estimated as at least 8.8 tons according to a report by the Berne Declaration, a NGO investigating the sources of Switzerland’s gold. The study alleges that almost all of the gold produced by artisanal miners slips through the country’s borders undetected. In 2013, the NGO reported that approximately seven tons of gold left the country undeclared and was exported to Switzerland via Togo.”

The EITI report also revealed that only 37 of the certified 63 trading houses declared their revenues to the Office of Mines and Geology (EITI, 2016).

The DRC’s MINDEX is also consistent with existing accounts of its mining sector:

“In the DRC, the picture in mining taxation is more difficult to quantify since a large part of the mining is undertaken by nearly two-million informal workers, and because most of the mining contracts of even the large companies are secret. Moreover, World Bank audits on the restructuring of Gécamines, the state-owned copper- and cobalt-mining enterprise, have never been made public (Tax Justice Network 2010). A 2004 audit by Ernst and Young found that Gécamines did not receive any share of the profits made by its joint ventures with private mining companies due to the terms of the mining contracts it negotiated with private companies. Of course, the president and senior mining officials were responsible for drafting these contracts so the implication is obvious” (Di John, 2010:19).

3.3.4.2 Evolution over time: Longitudinal analysis

Figure 6: Longitudinal analysis through the MINDEX for selected countries

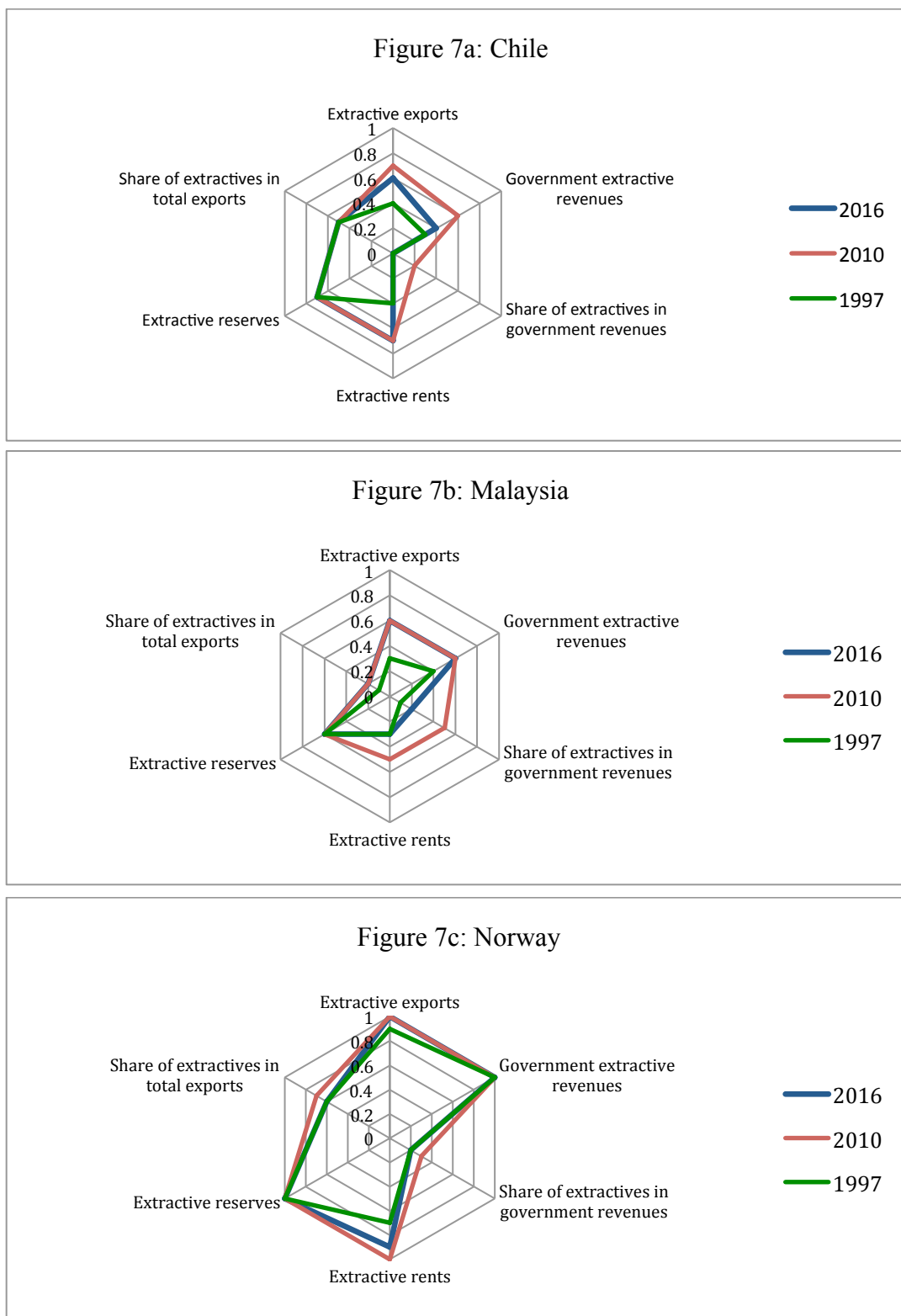


Figure 7d: Algeria

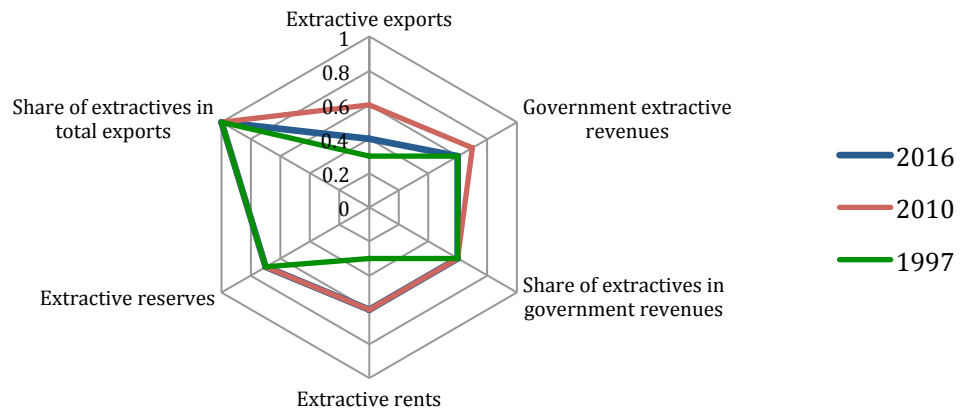


Figure 7e: Iran

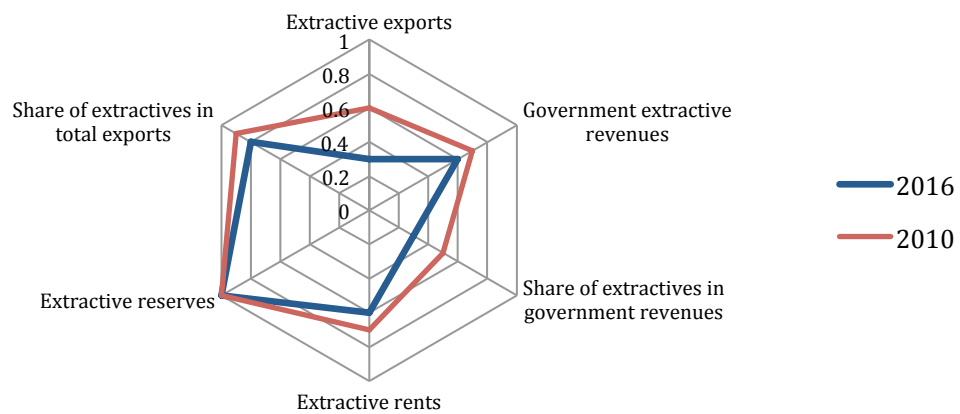
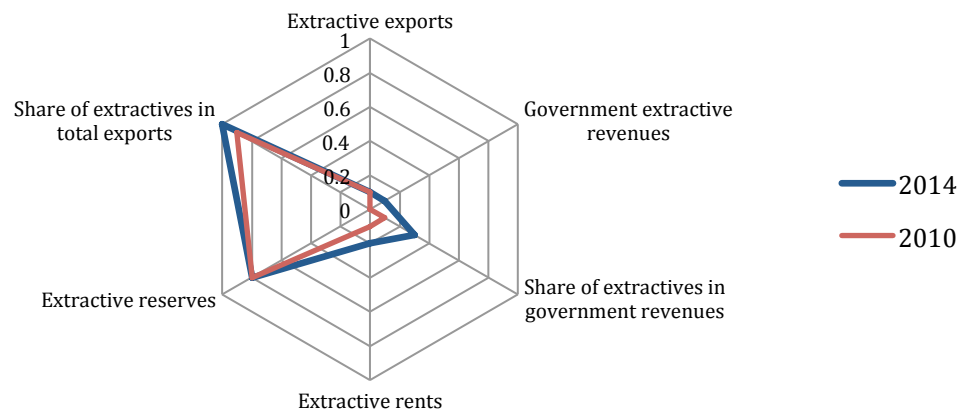


Figure 7f: Democratic Republic of Congo



The three dates selected for analysis reflect two shifts in commodity prices: 1997 and 2016 were marked by low commodity prices while 2010 was a year of commodity boom.⁵² Interestingly, for most countries, the 2016 ‘shape’ seems to return to its 1997 ‘shape’. The role of commodity prices should thus be highlighted. In addition, there is a contrast in the evolution of the “shape of resource abundance” over time in Algeria on the one hand, and in Malaysia, Chile and Norway on the other hand. In times of low commodity prices, the striking difference between these countries is accentuated. In years 1997 and 2016, while Malaysia, Chile and Norway shift towards case 6, Algeria shifts towards case 4 (dependency), which reflects its vulnerability to commodity price fluctuations. Norway, Malaysia and Chile have relatively managed to buffer their reliance on extractives for exports and revenues when commodity prices drop.

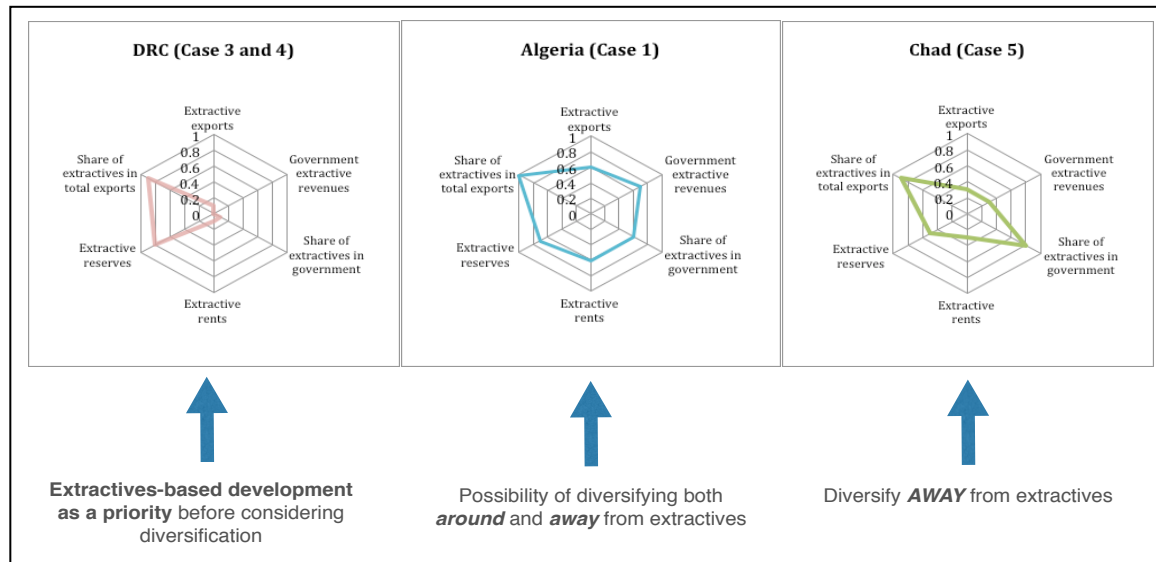
The diagnostic tool also suggests that more resource revenues have accrued to the government of DRC in 2014 than in 2010. This can be explained by the recent efforts from the DRC government towards appropriating more resource revenues, notably through a mining code revision process since 2012. This tool can thus serve to evaluate the impact of policies on extractives-based development and dependence over time.

3.4 IMPLICATIONS FOR DEVELOPMENT STRATEGIES & NEXT STEPS

This tool shows that the abundance and dependence on extractive resources are multifaceted. The degree to which diversification should be a priority also varies not only on its degree of resource dependence, but also to its degree of resource endowment. As shown by figure 7, for countries in case 5 (resource-dependent but resource-poor), the urgency to diversify away from extractives is very high. For countries in case 1 (resource-rich and resource-dependent), the urgency to diversify is also high, but diversification around extractive activities remains a potentially attractive policy option. For countries in case 3 or 4, the key priority is not necessarily diversification as much as it is the development and growth of the extractive sector. In those situations, it can be argued that extractives-based development should precede (or at least go alongside) diversification.

⁵² A longer time horizon for the longitudinal analysis would have been desirable, but data availability issues only enabled comparisons since 1997. Some observations can still be drawn.

Figure 7: Implications of the MINDEX for diversification strategies in selected cases



This tool can also be useful in helping to manage expectations from extractive resource endowment and discoveries.⁵³ For instance, recent oil discoveries have urged several African countries to design and implement local content policies, and led to high popular expectations for the future impact of petroleum on the domestic economy (Ovadia, 2016a). However, euphoria may not be helpful, and strategies should be guided by realism (Addison and Roe, 2018). In that context, this tool enables to carefully examine the degree of resource abundance by country, and helps to show that extractive resource exporters such as Chad or Mali may in fact be closer to the conditions of resource-poor East Asian countries than resource-rich countries such as Australia, Norway or Qatar. Emulating the resource-based development model of the latter countries may thus be misleading and out of reach. In such perspective, the scaling up of this tool will enable the analysis of patterns over time and across countries in order to identify how the impact of different developmental models across the different cases outlined in section 3.2. Further updates of the tools will also monitor more closely the role of commodity price fluctuations with year-by-year animations.

⁵³ As phrased by Addison and Roe (2018:10): “The soaring architecture of the Gulf states, built on oil wealth, captivates the modern imagination. The scale of the potential rewards inspires explorers, miners, and investors, while politicians dream of fast-tracks to national prosperity.”

Chapter 4: Resource revenue management in the context of diversification: bringing back a holistic developmental approach

4.1. INTRODUCTION

This chapter investigates the political economy of managing resource revenues as a pathway to prosperity. The management of revenues from exhaustible natural resources involves a number of inter-related challenges, such as inter-generational equity, commodity price volatility, diversification away from resource dependence, and shared prosperity. How and where should resource revenues be invested in remains the source of a contentious academic and policy debate. The academic literature remains divided on several issues, such as whether resource revenues should be investing domestically or abroad (see Bauer, 2015; Gelb et al. 2014a; Van der Ploeg and Venables, 2018; Witter and Jakobsen, 2018), consumed or invested (See Cherif and Hasanov, 2014; Hartwick, 1978; Henstridge and Roe, 2018), invested through a sovereign wealth fund, through the general budget, or by increasing in reserves at the central bank (see Mohaddes and Raissi, 2017; Van der Ploeg and Venables, 2018); earmarked or not (see OECD, 2016a).

A central policy question is how much of resource revenues should be invested in financial assets overseas for fiscal stabilization and how much should be invested domestically. This chapter shows that the mainstream models of resource revenue management, most of which are based on the permanent income hypothesis (suggesting that resource rich developing countries should invest all their resource revenues in financial assets abroad), are dominated by a short-term emphasis on consumption, fiscal stabilization and market equilibrium at the expense of long term structural change. As a result, such approaches have only addressed the symptoms of the resource curse (vulnerability to commodity price volatility) but not its root cause (productive dependence on commodities). This chapter therefore aims to reframe the resource revenue management agenda towards achieving export diversification.

While it is important to consider dynamics of government failures, this chapter seeks to

adopt a dynamic approach (across time, space and institutional conditions) to the trade-off underlying resource revenue management by shedding light on several factors and policy actions that contribute to influence the optimal allocation between domestic investment and saving in a stabilization fund. The alternative developmental approach outlined in this chapter puts forward institutional measures to reduce the risks of elite capture and investment inefficiency. It also features an active role of the state in promoting diversification through investments to relax financial and technological constraints in new tradable sectors.

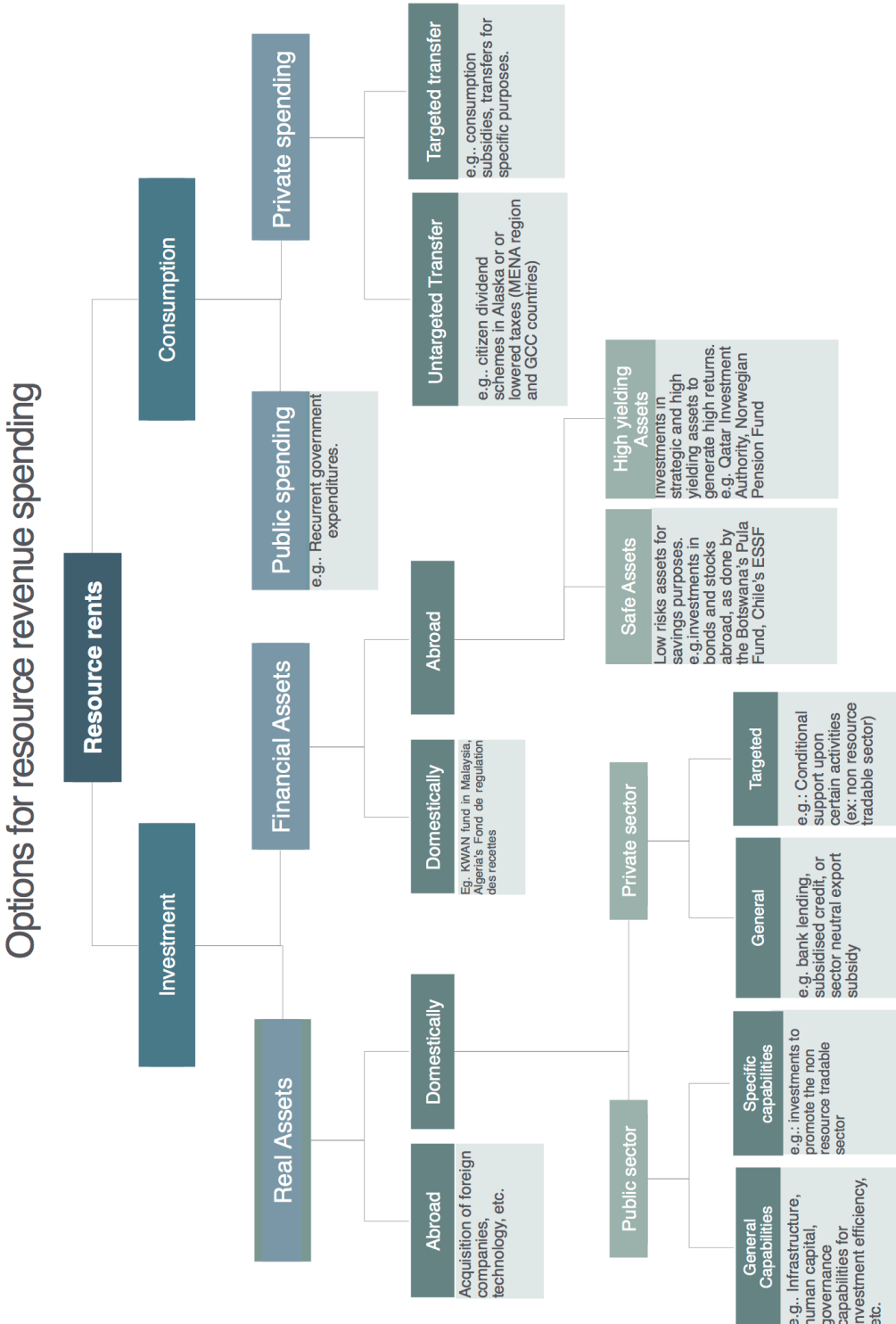
4.2 OPTIONS FOR MANAGING RESOURCE REVENUES

4.2.1 Mapping out different options to managing resource revenues

Figure 8 maps out several layers of decisions for the government to allocate resource revenues. First, government needs to decide whether resource revenues are to be consumed or invested. Domestic consumption can be fuelled through public or private spending (through citizen dividends, subsidies or through the tax/benefits system). If invested, resource revenues can be transformed into real or financial assets (which can be used as savings for future generations or for fiscal stabilization purposes if invested in low risk securities, as done by Chile's government, Botswana's Pula fund or Norway's pension fund). If invested in real assets, resource revenues can be invested through the public sector or private sector (e.g. through subsidized credits, production or export subsidies, or lowering public debt).

Those differences have important implications in terms of economic development strategy. Collier et al (2010) rightly pointed out that these different alternatives have fundamental implications in terms of the actors (state, private sector, or citizens) that get the ultimate control of the macro level spending from these revenues and micro level spending detail, and the overall balance between consumption and investment.

Figure 8: The main options for managing resource revenues



Amongst the different options for managing resource revenues, the public spending of resource revenues for both consumption and investment in real assets has often been criticized due to government failures that can be classified into two broad categories. The first one relates to risks of public investment inefficiency due to *political* factors (elite capture, through corruption, cronyism and political motivations; reduced efforts to collect taxes, which may hinder accountability). The second category relates to risks of public investment inefficiency due to economic factors (lack of government capacity to invest, spending beyond the absorptive capacity and crowding out issues; fiscal instability due to commodity price volatility and currency appreciation). It is indeed often argued that resource revenues accruing to the domestic economy can exceed absorptive capacity or can be wasted in unproductive investments, which can also create a vicious cycle of under-investment, inflation and appreciation of the nominal exchange rate, which reduces the competitiveness of non-resource tradable sectors, further dampening incentives for investment in those sectors and making diversification more difficult (See Arezki, 2011; Gelb et al., 1988; World Bank, 2013).^{54 55}

As a result, several scholars have favoured other ways to manage resource revenues. Some authors have emphasized that, in contrast to public expenditure, parking financial assets overseas is not constrained by the absorptive capacity of the economy, which is why financial investments should be prioritized until investments can be used *efficiently* in the domestic economy (Hentsridge and Roe, 2018; van der Ploeg and Venables, 2018). The more radical conventional policy advice on managing revenues from non-renewable

⁵⁴ The issue of capacity to invest is here distinct from risks of elite capture, based on the fact that elite capture stems from an intentional behavior that is politically or economically motivated, while government capacity to invest only reflect on the government's ability to conduct investments despite 'good' intentions.

⁵⁵ Gelb et al. (1988) and Arezki and Brückner (2010) have evidenced that commodity booms are often followed by large public investment projects that have been characterized by inefficiencies and resource misallocation. It is often considered that resource rich countries overspend when commodity prices and revenues are high, and cut back spending when commodity prices decline. Such spending behaviour affects the quality of public spending and generates macroeconomic volatility, which is detrimental to private investment, consumption and consequently economic growth (Bond and Fajgenbaum, 2014). Arezki (2011) consequently points out that poor long-run economic performance in commodity-exporting countries may stem from inefficiencies in government investments rather than from underinvestment.

resources, based on the permanent income hypothesis (PIH), is that such revenues should be systematically saved overseas in order to avoid fiscal instability from overspending resource revenues, and that domestic spending of resource revenues on the long run would be financed by the returns on savings and investments overseas (e.g. Davis et al., 2003; Barnett and Ossowski, 2003; Bems and de Carvalho Filho, 2011).⁵⁶ Bauer and Rietveld (2014) argue that SWFs should serve macroeconomic objectives instead of developmental ones, and should thus not be allowed to spend domestically. As Bauer (2015) further notes, governments whose funds cannot invest domestically (as in Abu Dhabi, Botswana, Chile, Ghana, Kazakhstan, Norway) generally achieve their returns objectives while countries where funds can invest or spend at home (such as Angola, Azerbaijan, Equatorial Guinea, Kuwait, Nigeria and Russia, often become conduits for corruption, patronage and financial mismanagement. Resource rich countries have often placed their resource revenues in SWFs that have invested in external assets, especially securities traded in major markets to respond to sterilization, stabilization, and risk/return objectives. A study conducted by Truman (2011) has shown that overseas holdings constitute 84% of total investments in a sample of 60 SWFs.⁵⁷⁵⁸

Others scholars have argued that resource revenues should be distributed directly to citizens (e.g. Devarajan, 2019). The direct distribution to citizens through cash transfers,

⁵⁶ The PIH was developed by Friedman (1957) and describes how agents spread consumption by supposing that consumption is determined not just by the current income but also by the expected income in the future. The PIH can be calculated using the following formula, with M referring to the annual extractive income received, y as the number of years of investments, r as the real rate of return on investments and X as the real income received (World Bank 2013):

$$X = M \left[1 - \frac{1}{(1+r)^y} \right]$$

⁵⁷ More recently, several resource-rich developing countries have started to establish SWFs that are already mandated to invest domestically (Monk 2013; Gelb, Tordo and Halland, 2014a).

⁵⁸ A further consideration where should any financial savings be placed, in the Central Bank or through the creation of a SWF? Henstridge and Roe (2018) argue that saving through an SWF requires initial and ongoing investment, (including set-up costs and the ongoing administrative costs) which are only justified if the revenues from natural resources themselves are both large and likely to be sustained over many years, as in Norway, in contrast to LICs such as Tanzania and Mozambique would be unlikely to build capital superior to the fixed costs of establishing and then operating a fund. In such situations, saving via the central bank may be preferable.

subsidies or tax breaks) would improve accountability (by encouraging citizens to monitor oil income and forcing government to rely on normal taxation for revenues) as well as widen the opportunity for citizens to invest in human capital to complement resource wealth, rather than concentrating access to capital within a small elite (Gelb and Grasmann, 2009; Devarajan, 2019). In the most direct cases of redistribution to citizens (excluding indirect transfer through social housing) the government retains neither macroeconomic nor microeconomic control over spending.

Few states, such as Alaska, have implemented citizen dividend schemes, but few other developing exporters followed this path. Instead, many oil exporters for instance distribute rents to citizens indirectly through lower taxes and consumption subsidies, in particular fuel subsidies, or mechanisms of social housing distribution (as in Algeria), or even grants to newlyweds (as in several Middle Eastern countries).⁵⁹ Crivelli and Gupta (2014) have indeed evidenced a substitution between natural resources and domestic (non-resource) tax revenue, with around 30 cents in non-resource tax revenue being lost with each additional dollar in resource revenue.

However, public investment of resource revenues should not be dismissed so quickly. First of all, there are severe limitations to the ‘alternative’ ways to manage resource revenues mentioned above. As further explained in sections 4.3.1 and 4.3.3, saving resource revenues in financial assets can lead to very high opportunity costs for capital scarce developing countries that need to diversify their economies. Even in the case of direct redistribution to citizens, several issues should be raised.

Secondly, there are fundamental issues related to the investment behaviour of private individuals. On the one hand, according to Collier et al (2010:22), citizen dividends enable to transfer the absorption problem and microeconomic detail of spending to

⁵⁹ Gelb and Grasmann (2009) rightly argue that the fiscal costs of holding down domestic prices of petroleum derivatives and natural gas to well-below world market levels can be considerable, and stems from policies that are inefficient and difficult to reverse. According to IMF staff estimates, gasoline subsidies in Algeria represented 14 % of GDP in 2015, which is almost as large as the fiscal deficit itself and twice the combined budgets of the health and education ministries (Jewell, 2016). Such subsidies benefit the rich more than the poor, given that the richest 20% consume six times as much fuel as the poorest 20 % (ibid.)

private individuals, which are much better at identifying investment projects than government officials, and have sharper incentives to implement them well and make sure they succeed. Devarajan (2019) further justifies the direct distribution to citizens by arguing that the mismanagement of oil revenues relates to the public expenditure on consumption through inefficient subsidies and public-sector wages, over capital.

On the other hand, at least four counterarguments can be provided. Firstly, there is no guarantee that the choices of individuals will lead to an optimal macroeconomic profile of consumption versus investment rates. For instance, while controversies emerged in Algeria regarding the alleged misuse of microcredits for consumption purposes, it is reasonable to be skeptical of the use of unconditional direct cash transfers for investment.⁶⁰ As Arezki (2011) best explained, direct redistribution may fuel increased consumption as opposed to investment, which may infringe on the Hartwick rule.⁶¹ In addition, the effect of commodity price volatility would mean that if the money is used for consumption, the increase in consumption is unsustainable and should be reversed as soon as possible before it becomes entrenched into habits, especially since volatility in consumption is challenging to deal with (Collier et al, 2010).

Secondly, redistribution to private citizens may also not lead to an optimal macroeconomic effect of investment. Dividing resource revenues through citizens would lead to investments that are too small in scale to have transformative effects at the macroeconomic level, and consequently would not contribute to export diversification.⁶²

⁶⁰ In Algeria, the controversy regarding the claimed misuse of microcredits awarded by the National Agency for Youth Employment (ANSEJ) was further accentuated by a former Prime minister's support of the misuse of microcredits for personal consumption and weddings. That said, it would seem that only few hundred cases of misuse were flagged, few thousands never concretized and 13.608 micro-enterprises dissolved after their creation, which combined only represents 5% of the total credits awarded (Hallas, 2018).

⁶¹ "Individuals may underinvest the proceeds of resource revenues in, say, education and health, as they may not internalize the social benefits of those investments. One possibility would be to redistribute not necessarily directly, in the form of cash transfers, but rather in the form of greater information and enhanced transparency concerning the management of revenues and on the rationale behind the choice of the level and composition of spending. Citizens must take part in the major debates addressing public action. That will make it possible to improve the efficiency of government spending, which in turn will benefit the citizenry." (Arezki, 2011).

⁶² Similar criticisms can be applied to microfinance (see Bateman and Chang, 2012)

Indeed, in contexts of urgent diversification needs, it is not guaranteed that redistribution to private sector will lead to revenue mobilization in the non-resource sector, as opposed to the resource sector. Markets alone have often meant that investments would remain confined to resource sectors that are considered to be areas of comparative advantage. In the meantime, the process of diversification with the emergence of new industries involves a process of learning by doing, R&D, and risk that private individuals may not be able to afford alone with sole dividends from resource revenues (as shown in chapters 8 and 9). The need for the government to retain macroeconomic control thus stems from the “non-automatic” nature of the process of economic diversification.

A third issue has to do with the intergenerational distribution of the benefits, especially if the generation of private individuals that benefit from a resource boom use their dividends to boost consumption instead of investing. The consequence of such spending behavior would be that current generation benefit from resource revenues at the expense of future generations. In contrast, as argued in section 4.3.2, domestic investments can lead to long-term benefits that will put consumption paths on a gradual increase.

A fourth counter-argument is that taxation has positive outcomes on state accountability and should not be eliminated. While Collier et al. (2010) noted that an advantage of redistribution to citizens is that, in countries with bad governance, it is important to get funds out of the reach of government as rapidly as possible, it is worth noting that the lack of taxation is likely to erode the basis of the social contract between people and the state.⁶³ Indeed, a negative system of taxation will likely preempt greater societal demands for accountability and scrutiny over government spending, further allowing for bad governance (Cammett et. al, 2015; Eubank, 2012; Moore and Rakner, 2002). Recent literature has emphasized the importance of taxation for state building through its impact on the emergence of grassroots taxpayer associations that could monitor the efficiency of government spending (Brautigam, Fjeldstad, and Moore, 2008).

Besides putting forward the limitations of the alternatives to the domestic investment of

⁶³ Collier et al (2010) also point out that this argument is of doubtful relevance because the countries with the worst governance are unlikely to implement such a scheme.

resource revenues, this chapter presents a holistic and dynamic approach to managing resource revenues. Such approach is holistic because it puts forward the interconnection between different resource revenue management options; and is dynamic because it puts forward the factors that impact resource revenue management across time, space and institutional conditions.

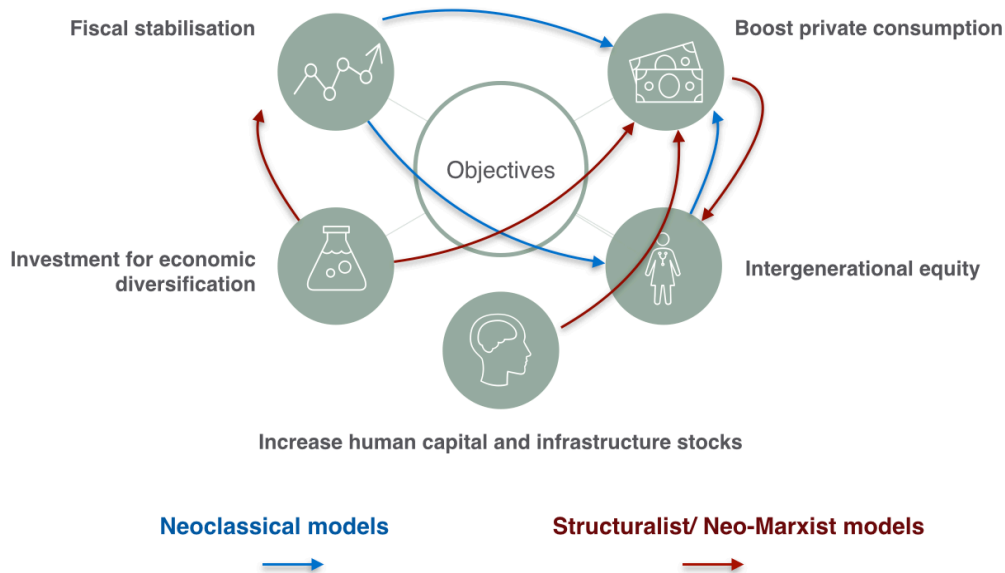
4.2.2 Holistic approach to resource revenue management and underlying trade-offs

This chapter suggests a different outlook of resource revenue management by drawing on various theoretical approaches to the interrelation between various resource revenue management objectives (see figure 10). Ultimately, decisions on how to spend resource revenues depend on which objectives are to be pursued, which are inherently political. However, a holistic approach to resource revenue management sheds light on the interrelation between different objectives of resource revenue management (such as intergenerational equity, fiscal stabilization, economic diversification, or private consumption), which are not mutually exclusive.

For instance, the World Economic Forum (2018:20) recently identified a list of uses of resource revenues for maximizing welfare “in order of priority where each subsequent use should *not* be pursued until its predecessor has been successfully institutionalized”. In such list, economic diversification came third, preceded by the accumulation of precautionary buffers to protect against commodity price volatility, and the smoothening of consumption across generations by investing revenues in long-term assets. This thesis goes a step further by arguing that economic diversification is crucial for the long-term achievement of fiscal stabilization and smoothening consumption over time. As a result economic diversification should be embedded in resource revenue management strategies in resource-dependent economies rather than being considered as independent from - and subsequent to - fiscal stabilization strategies.

Figure 9 shows that different theoretical schools feature different conceptions of the interconnection between different objectives of resource revenue management.

Figure 9: Various objectives of resource revenue management and their interconnections



While neoclassical models (mostly based on the permanent income hypothesis) somehow question the ability of governments to conduct productive investments and is mostly concerned with ‘consumption’, other approaches (such as the Hartwick rule and the Feldman-Mahalonobis model), that are more in line with Keynesian and neo-Marxian perspectives, suggest that revenues generated by exhaustible resources should reinvested into the production of capital goods in order to reach a high standard in consumption but also to accumulate productive capabilities (that are capable of generating income after natural resources are depleted). Structuralist (and particularly Prebishian) insights also reveal that the diversification of a country’s productive structure is the most sustainable way to reduce a country’s vulnerability to commodity prices fluctuations (and thus the best way to achieve macroeconomic stability). For instance, Malaysia’s public investments led to a large short-term fiscal deficit but had long-run transformative effects on the domestic economy.

Drawing on these alternative theoretical bases, the next sections further explain why, how and when domestic investments should be prioritized in resource-rich countries.

4.3 FIVE REASONS WHY THE DOMESTIC INVESTMENT OF RESOURCE REVENUES SHOULD BE PRIORITIZED IN SOME COUNTRIES.

This section presents five strong reasons to support the prioritization of domestic investment of resource revenues (over their investment in financial assets overseas) in resource-rich capital-scarce and labour-rich developing countries.

4.3.1 Breaking the pattern of low investment rates that characterizes developing economies

First, resource revenues represent an opportunity to alleviate the low investment rates that characterize capital scarce developing economies, by relaxing financing and fiscal constraint. While high growth countries invest 5 to 7% of GDP per year (over and above expenditures on basic education) in incremental education and infrastructure, most countries with lower growth invest only around 3% (Collier et al., 2010). To date, even developing countries with natural resource rents have not had domestic investment rates commensurate with their increase of resources revenues (ibid.). The pattern of under-investment in the tangible and intangible assets, prominently in education, infrastructure, often leads to a stagnation of the domestic economy's productive structure, which further discourages private investments. Hence, while there is a need to cushion to impact of resource revenue volatility, this should not be at the expense of allowing the domestic economy to benefit from commodity booms (Collier et al, 2010).

Fiscal stabilization through resource revenue investments in financial assets overseas thus bears a very high opportunity cost because funds would not be made available for domestic investment, thereby ignoring the developmental needs of certain countries. As pointed out by Collier et al (2010:112), "if SLFs are to be large enough to offer a reasonable chance of successfully smoothing, it implies that domestic spending of the revenue is extremely low". Berg et al. (2012) also argue that while the conventional PIH advice may be attractive when resource revenues are expected to be exhausted within 10 to 20 years, the PIH bears very high opportunity costs on the long run and does not take into account the developmental needs of capital scarce developing economies, which is

why the PIH has been increasingly criticized in recent years (e.g. Araujo et al., 2012; Collier et al., 2010; International Monetary Fund, 2012; Sachs, 2007; Takizawa et al., 2004; UNCTAD 2006a; van der Ploeg and Venables, 2008, 2011; van der Ploeg, 2010; Venables, 2010). Indeed, while it makes sense for a country such as Norway to save and invest its revenues abroad since they already have considerably high levels of infrastructure and educated labour force, resource rich developing countries such as Algeria, Angola or Nigeria could generate a lot of growth by investing domestically.⁶⁴

The case of Botswana illustrates quite well the opportunity cost stemming from overseas investments. While the country is often praised for its strong institutions and macroeconomic management of resource revenues through savings of diamond revenues for future generation and overseas investment, the extent to which its domestic economy benefited from such resource is quite debatable. Diamond rents accrue to the Pula Fund, whose investments are all external to Botswana and thus the activities related to those investments do not have any significant direct domestic macroeconomic implications (International Forum of Sovereign Wealth Funds, 2018). Meanwhile, in terms of domestic economic and human development, Botswana's HDI has not improved much and the economy has not managed to diversify away from diamonds. This example shows that an overarching focus on macroeconomic stability and strategies to invest abroad, though they help address short-term fluctuations, can be detrimental to long-term development if they delay the transformation of the domestic economy.

⁶⁴ In Norway, all government income from the petroleum sector is channelled into the Government Pension Fund and the amount paid out from the fund is a yearly decision by Parliament (Torvik, 2011). The objective is that payments out of the fund shall equal the real return of the fund, which is expected to be 4% on an annual basis, although this is not a binding rule. Interesting, even in Norway (where the opportunity cost of investing abroad is arguably lower than most developing countries) some politicians still argue that there are high opportunity costs and that Norway should use more of the fund for domestic spending (ibid.) In Alaska, the payments out of the fund are decided by the constitution, according to which 21% of the net return for the last five years can be spent (given that this amount does not exceed the sum of net income of the fund the last year and what is left on the earnings Reserve account) (ibid.). Lump sum transfer to citizens of the State often constitute half of what is spent domestically, and still represented USD 1281 for each individual in 2010 for instance (ibid.) It is obvious that most developing resource rich countries that are less resource rich in capita terms than Canada would not benefit in the same extent from a similarly conservative rule.

In addition, it is reasonable to assume that the returns from domestic investment in capital scarce developing countries are higher than the returns from investments in foreign financial assets (Collier et al., 2010). The domestic investment of resource revenues can hold the potential to put the economy on a growth trajectory that will in turn increase income rates, improve public infrastructure, reduce public debt, as well as reduce the interest rates that an economy faces in international capital markets, which would subsequently crowd in private investments (Venables, 2010; World Bank, 2013).

As a consequence, saving in international capital markets or direct redistribution to citizens are only a superficially attractive option. Indeed, in the context of strong institutional capacities, in contrast to the redistribution to citizens, public investments for industrial development or government lending to the private sector offer more insurance that resource revenues would be used for investment rather than for consumption. It can be argued that some revenues should be allocated for consumption to build public-sector capability through financing operations and maintenance costs and public-sector wages (Henstridge and Roe, 2018) but such decisions can often get hijacked by political economy pressures (e.g. to hike public-sector wages) as in the example of Ghana (see Bawumia and Halland, 2018). As a result, one way to circumvent such risks would be to set rules according to which spending in consumption should be financed through non-extractive revenues in the general budget (and regular taxation), while extractives revenues could be earmarked for investments.⁶⁵

4.3.2 Sustainable and gradual increase in private consumption

This section explains why raising long-run consumption is more sustainable through immediate domestic investments, which generate growth that benefits all generations.

⁶⁵ Henstridge and Roe (2018) put forward that because LICs also suffer from a serious deficit of adequate operations and maintenance of their *existing* capital stock, some spending should be designated for consumption (e.g. salaries and operation and maintenance activities) rather than only for investment. In addition, building public-sector capability is essential to increase the returns to public capital in the long term, which is why some spending must be used to address immediate short-term needs such as ongoing operations and maintenance of existing infrastructure and public-sector wages.

Savings for future generations by accumulating revenues in a SWF pushes benefits too far ahead in the future (Collier et al. 2010). In contrast, direct or indirect redistribution to citizens may lead to immediate consumption at the expense of future generations. According to an analogy with a firm made in a World Bank report (2013:35) “using natural resource revenues to finance consumption is akin to a firm financing dividend payouts by liquidating its assets: both increase present income at the expense of future income”. In addition, using resource revenues to finance an immediate increase in consumption can be problematic due to the volatility of resource revenue. Cutting back on consumption is politically undesirable, as individuals get used to higher consumption patterns, which makes it more challenging to cut back spending.

In contrast to the PIH, the Hartwick rule and the Feldman-Mahalonobis model shed light on the trade-off between immediate and future consumption. Hartwick (1978) argued that an optimal constant level of consumption can be sustained if the value of (net) investment equals the value of rents from extracted resources at each point in time. Governments should consequently convert resource revenues towards other forms of assets that are capable of generating as much income as the natural capital that is being replaced (ibid). According to the World Bank (2011b), few resource-rich countries (such as Malaysia) have followed the Hartwick Rule over the last 35 years, because resource rents tend to be used to finance consumption rather than investment.⁶⁶ In many instances, the outcomes that would have been achieved through the Hartwick rule are very different than actual outcomes. For instance, Nigeria could have had a stock of produced capital four times higher than the actual stock, and Gabon could have had a stock of produced capital of USD68,000 per person, compared to USD58,000 in oil-poor South Korea (World Bank, 2013:36).

⁶⁶ The study included net foreign assets but did not include investments in human capital given “the lack of an accepted production function converting education spending into human capital” and given that that educational expenditures have not been significant compared to physical capital investment (Hamilton et al., 2006; World Bank, 2013).

4.3.3 The importance of export diversification for growth and employment according to the degree of resource abundance per capita.

4.3.3.1 The theoretical argument and hypothesis

Although financial investments can help achieving fiscal stabilization purposes, they are unlikely to enhance the productive capabilities of the national economy because they will have no direct impact on the domestic private sector, especially if they are not linked towards the acquisition of strategic assets that are related to domestic capabilities (Chang, 2007b). In contrast, diversification requires the active use of resource rents to increase the productivity of other exportable sectors to reduce their production costs, whether by funding infrastructure, subsidies or other methods (Cherif and Hasanov, 2014; Gelb and Grassman, 2009). In the context of resource dependency, governments should prioritize high long-term rate of investment that might have transformational macroeconomic effects, rather than aim to achieve fiscal stabilization alone. Recent macroeconomic studies support the argument that domestic investment of resource revenues holds the potential to promote economic growth and economic diversification (Berg et al. 2012; Collier et al. 2009; van der Ploeg and Venables 2010; Isaksson, 2009).⁶⁷

Now that we have established that domestic investments are necessary for export diversification, it is important to justify why should resource revenue management be oriented towards achieving export diversification objectives rather than focusing on fiscal stabilization or intergenerational equity. Why shouldn't countries follow the example of Norway who has successfully invested its revenues in financial assets and accumulated a large SWF? My main hypothesis revolves around the degree of per capita resource wealth: while very resource rich per capita countries (defined as the 10th decile in terms of extractives rents per capita, henceforth VRR) seem to be able to develop despite natural resource dependence, there seems to be a strong correlation between economic growth and export diversification for medium resource rich per capita countries (which rank in the 8th and 9th deciles according to extractives rents per capita – henceforth

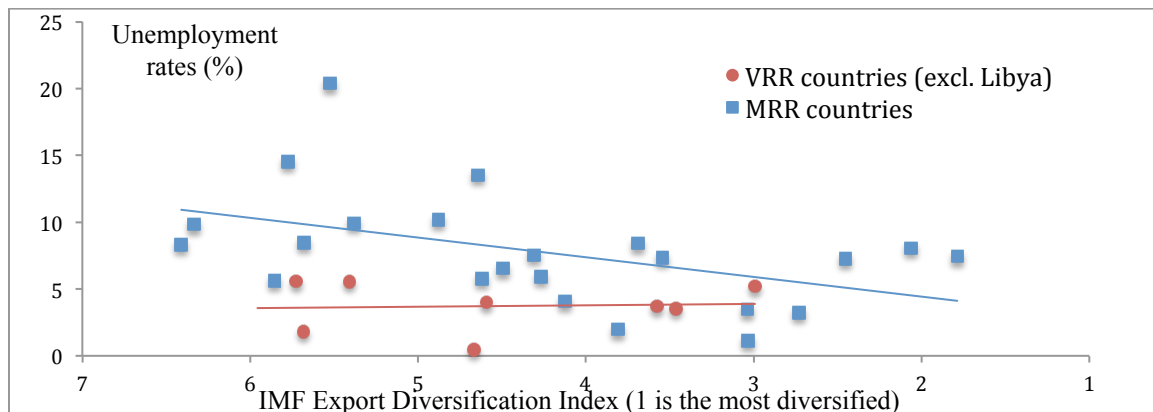
⁶⁷ Gelb et al. (1988) found a negative correlation between domestic investment of resource revenues and economic growth. The difference in results can be explained by the fact that what matters is not just the size of public investment but also its design, scope and implementation.

MRR). This hypothesis implies that VRR countries can more easily sustain growth without necessarily undergoing a transformation of their economy while diversification is a key factor of economic development for MRR countries, which should consequently follow a pattern of resource rents management that focuses more on domestic investment for diversification than VRR countries.

4.3.3.2 The evidence

This section presents quantitative evidence on the heterogeneous impact of diversification on growth and employment according to the degree of resource abundance per capita. The first observation that can be made concerns the influence of the level of resource rents per capita. Figure 10 shows that VRR countries tend to have low unemployment rates regardless of their diversification rates, which is not the case for MRR countries.

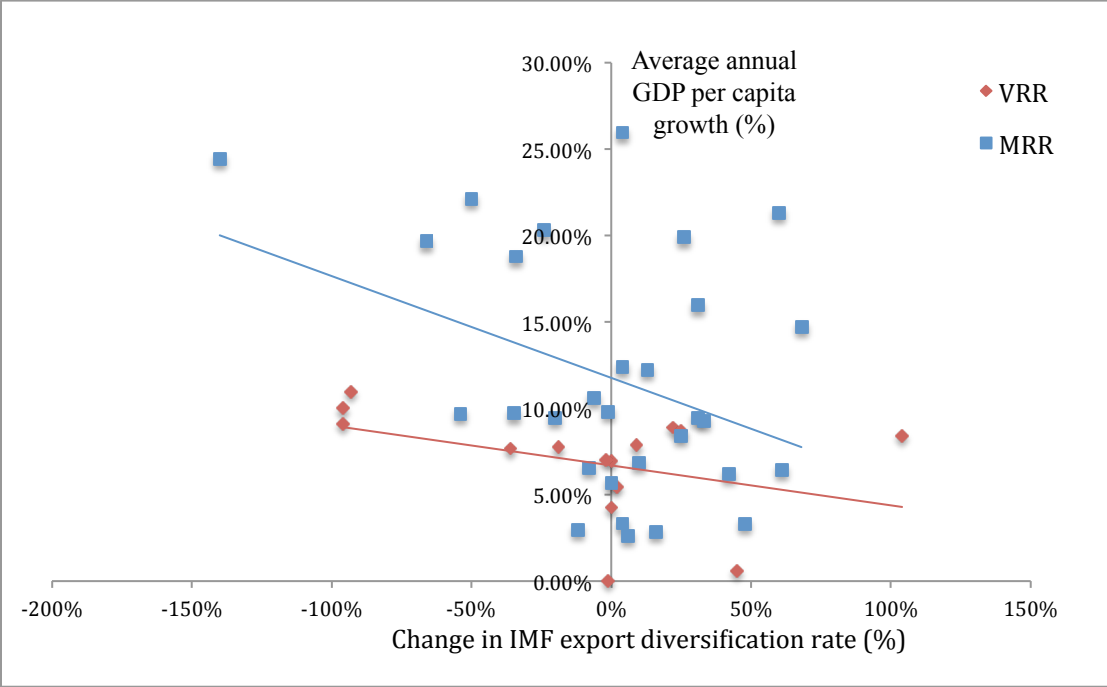
Figure 10: Export diversification and unemployment rates (2010)



Sources: Data from IMF (2018c) and World Bank (2019)

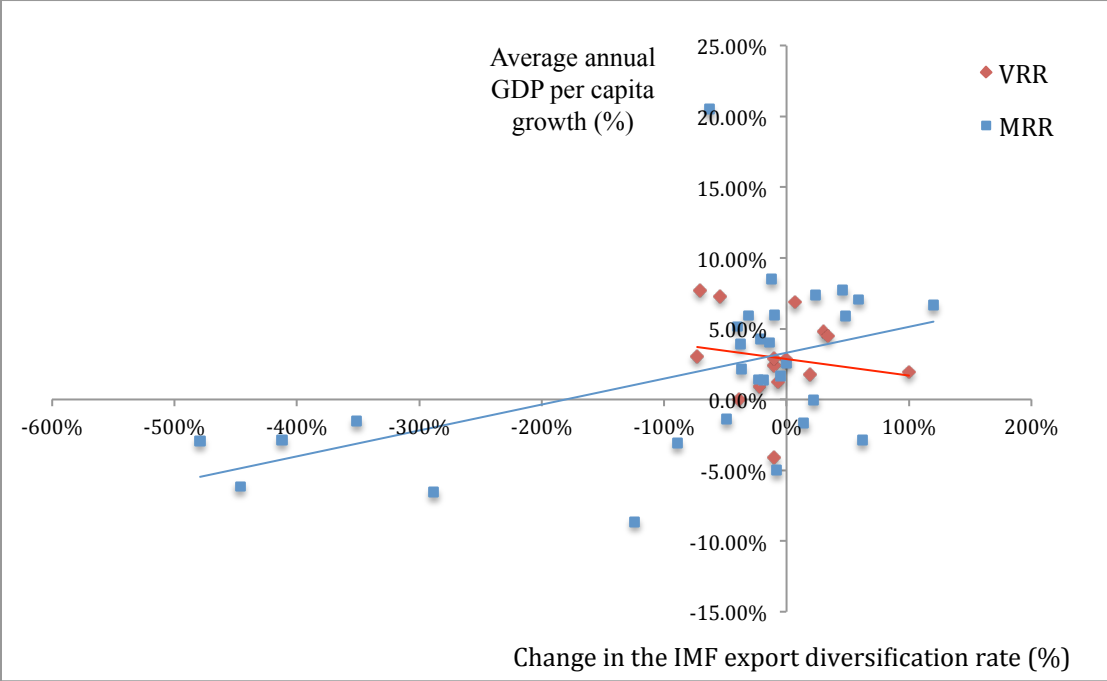
Panel data analysis also reveals the heterogeneous impact of export diversification on growth according to the level of resource abundance per capita. However, another major observation arises: the variation between VRR and MRR countries depends according to commodity price cycles. Figure 11 shows that when commodity prices are high, all resource rich countries achieve positive growth rates regardless of the changes in their export diversification. However, in times of low commodity prices (figure 12), while VRR countries still achieve positive growth rates regardless of changes in their diversification rate, diversification is strongly correlated with growth in MRR countries.

Figure 11: Changes in GDP per capita and diversification rates in times of high commodity prices (2000-2010)



Sources: Data from IMF (2018c) and World Bank (2019)

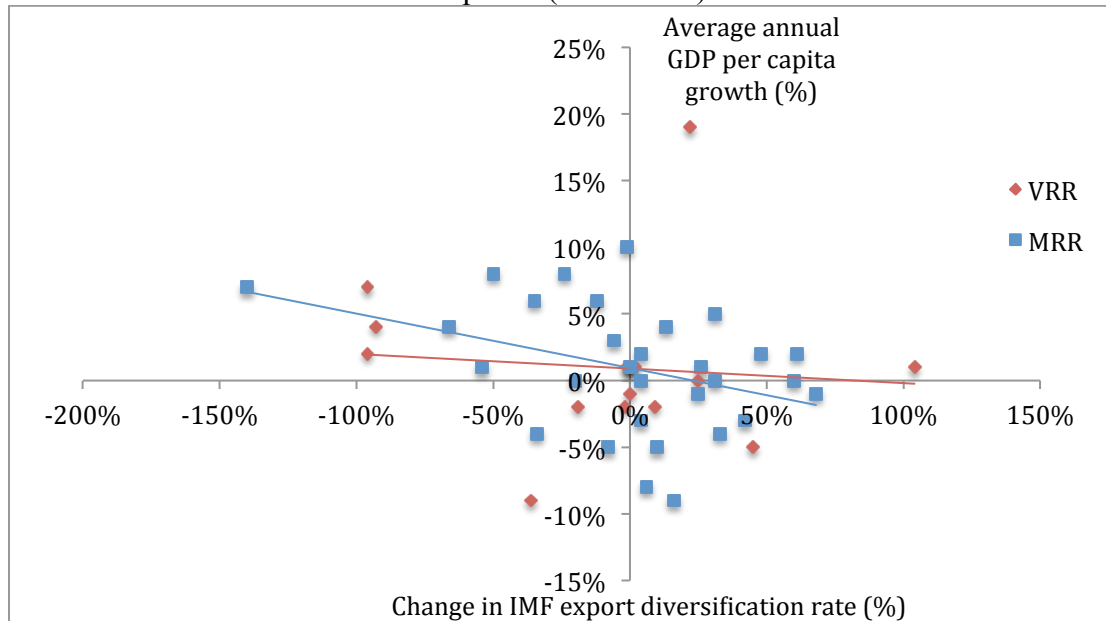
Figure 12: Changes in GDP per capita and diversification rates in times of low commodity prices (1990-2000)



Sources: Data from IMF (2018c) and World Bank (2019)

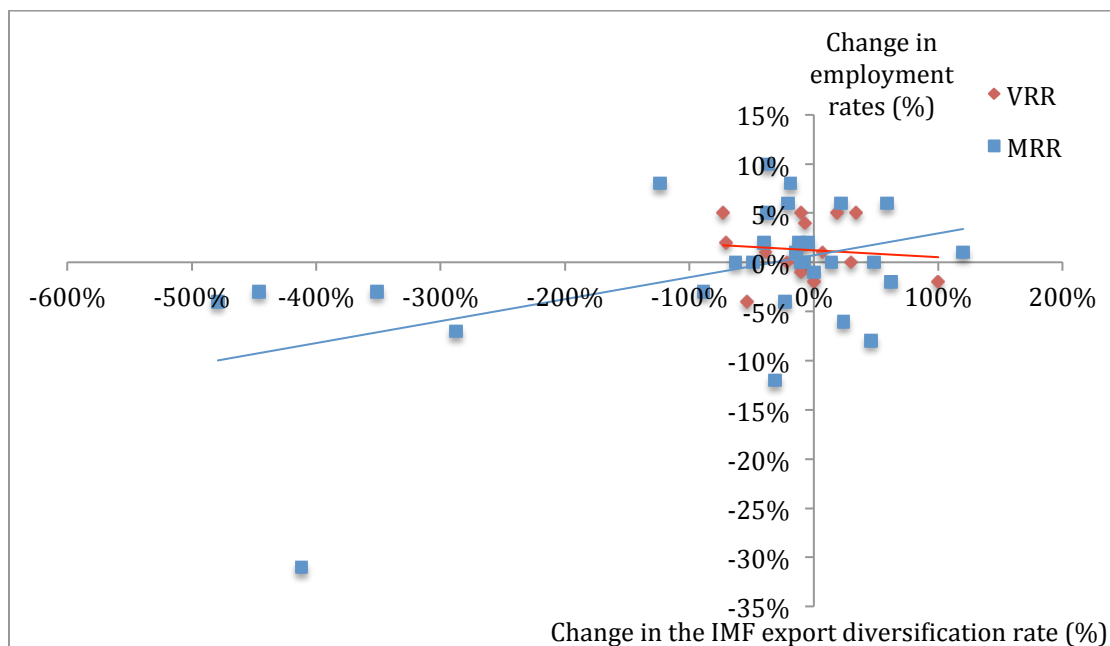
Similar trends are observed when establishing the correlation between unemployment and export diversification (see figures 13 and 14).

Figure 13: Changes in employment and diversification rates in times of high commodity prices (2000-2010)



Sources: Data from IMF (2018c) and World Bank (2019)

Figure 14: Changes in employment and diversification rates in times of low commodity prices (1990-2000)



Sources: Data from IMF (2018c) and World Bank (2019)

The statistical analysis of this chapter reveals that while some of the most resource rich per capita countries (such as Norway, UAE, Qatar, Saudi Arabia, Kuwait) can manage to grow and maintain low unemployment rates without diversifying their export basket, export diversification is a strong determinant of jobs creation and GDP growth in remaining resource rich countries, particularly in times of low commodity prices. Two main points can be made in light of such findings. First, because the impact of diversification depends on commodity price, scholars and policy makers should not be fooled by the influence of commodity booms. Second, scholars and policy makers in MRR countries should not be fooled by the experience of VRR countries. The PIH (and by extension the Norwegian model) might not be a ‘one size fits all’ approach. These countries have indeed tended to follow pattern of financial diversification that should not necessarily form the basis of lessons for policy making in resource rich developing countries because investment in financial assets are unlikely to lead to productive transformation. Those findings can contribute to reshape the discourse on resource-based development, which has in recent years emphasized the “Norwegian model” while neglecting the role of export diversification and production.

4.3.3.3 How can we explain these developmental differences across categories of resource-rich countries?

While it would be reductionist to attribute a nation’s development path solely to its per capita resource endowment, degrees of per capita resource abundance influence patterns of resource-based development and diversification by reframing the nature of political, economic and societal challenges. This section explains how the degree of resource wealth per capita influences both political factors (such as pressure for rents distribution, consent and governance) and economic factors (such as employment generation in the context of the low labour intensity of extractive industries).

One of the main political economy differences between VRR and MRR countries concerns the compromise between social redistribution and long-term growth. Unsurprisingly, higher levels of resource rents per capita provide the state with enough financial resources for a broad social redistribution among citizens without compromising

or cutting back the investments needed to promote economic growth. In contrast, in resource rich countries with a lower per capita resource wealth, there is a clear threat of economic stagnation caused by excessively redistributive policies, as well as a threat of economic disparity amongst the population if growth is encouraged at the expense of social spending. Such countries need to find a compromise between their social commitments and their public investment budget to encourage growth, which is possible but requires much more efficient economic management than in VRR countries. In the case of Malaysia, this dilemma left effective economic management and the reinvestment of rents to encourage growth, especially employment-creating growth for Malays, as the only option (Abidin 2001; Rasiah 2006).⁶⁸

In a similar perspective, Cammett et al. (2015) noticed that in the MENA region, countries displaying very high oil abundance per capita tend to have higher political governance records than those with medium resource rich per capita countries. They explain this divergence in terms of the sets of incentives facing rulers in high and low population oil-rich countries and the ways in which resources shape or consolidate political settlements (Khan, 2010), which affect the way rulers distribute oil rents. Cammett et al. (2015) further explain that regimes featuring high oil earnings per capita (such as the Gulf states) tend to prefer relying more on the distribution of rents to buy consent and social peace in order to secure their power and prevent greater societal demands for accountability, which is less risky than repression. Their governance system is based on patronage and negative taxation system in which oil rents are distributed through social services, subsidies, housing, energy, water, and a private sector consisting of families associated with the rulers which benefit from state contracts (ibid).⁶⁹ Meanwhile, MRR countries face a more challenging situation because even though they have large resource endowments, resource rents may not suffice to buy their populations'

⁶⁸ Despite facing social stability threats and initially attempting a populist redistribution toward less privileged groups, Malaysia shows that "even mineral rich countries with a history of instability and fractious politics can experience windows of opportunity for good management that leads towards diversification" (Gelb, 2010:18).

⁶⁹ Nevertheless, Cammett et al (2015) also point out that buying consent is not just about a distribution of rents but also long term and sustainable access to economic opportunities and facilitation to profit making opportunities to the population and granting more political rights.

support. Cammett et al (2015) argue that such resource rich countries tend to employ more repression. This logic relates to what North, Wallis and Weingast (2009) call a “limited order arrangement”: when resources are plentiful, ruling coalitions can afford to be broader and thus more stable.⁷⁰ In contrast, when resources are more constrained, ruling coalitions tend to be narrower because it is fiscally impossible to buy the consent of a large portion of the population. Resource rich countries with large populations consequently tend to display a selective allocation of rents and thus of economic opportunities, less developed private sectors and big coercive apparatuses repression, which is why they are thought to suffer from the resource curse (Cammett, et al., 2015).

This thesis contributes to this debate by providing a different argument that focuses on the role of diversification. We should not assume that the only policy alternative to buying social consent is repression.⁷¹ Another central issue for policy-makers in medium resource rich countries is how to maximize the socio-economic benefits of resource rents while dealing with high social expectations in a context where excessive social redistribution are likely to lead to economic collapse. Here, employment creation is of central importance. VRR countries can afford to transfer rents to their populations without the need to generate employment (through the private sector in particular). Instead, these countries, such as Saudi Arabia, can rely on the public sector to generate excess employment (thereby transferring rents).⁷² MRR countries usually cannot afford similar strategies and are more likely to need to generate employment by diversifying their economy, especially given the low labour intensity of extractive activities.

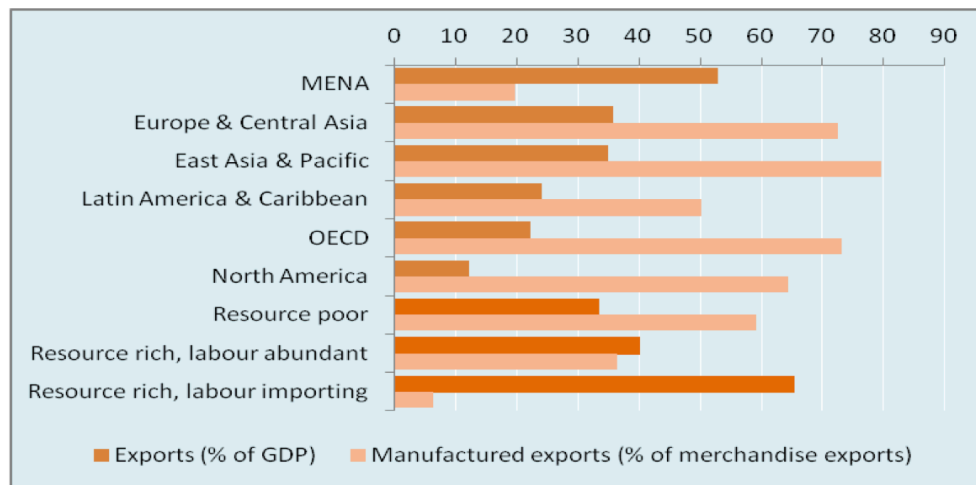
⁷⁰ Such argument challenges the resource curse argument that oil wealth leads to poor institutional quality (see Chaudhry 1997, Karl 1997). It also echoes the observation in Addison (2009) that economic success reduces the need for rulers to use violence to secure their power.

⁷¹ Cammett et al. (2015) recognize that a third strategy available to rulers would be the promotion of long-term economic development but they note that it is difficult to implement in most developing countries. However, they acknowledge that in Algeria and Iran, leaders attempted to construct developmental states before their ambitious development plans failed. They also recognize that there is no resource determinism and that high per capita resource wealth is not necessarily associated with inclusive distribution, as shown by the case of Equatorial Guinea.

⁷² The Saudi labour market has been characterized by a dependence on the public sector (e.g. public administration and defense, health and education), where average wages for Saudi nationals is far larger than in private employment in other sectors (see McKinsey, 2016).

Those dynamics of rents distribution and employment generation have obvious economic implications.⁷³ It can be argued that VRR countries face less pressure than MRR countries to industrialize through labour-intensive manufacturing activities, and instead are more likely to invest in financial assets and services. This argument is confirmed by the following two figures, which show that the highest per capita oil income countries feature the lowest share of manufacturing exports amongst resource rich economies.⁷⁴ Those findings echo the finding in Sachs and Warner (1995:19) that “for the most highly resource endowed economies [...] the natural resource base is so vast that there is no strong pressure to develop an extensive industrial sector ”.⁷⁵

Figure 15: Manufactured exports as a share of merchandise exports in 2009



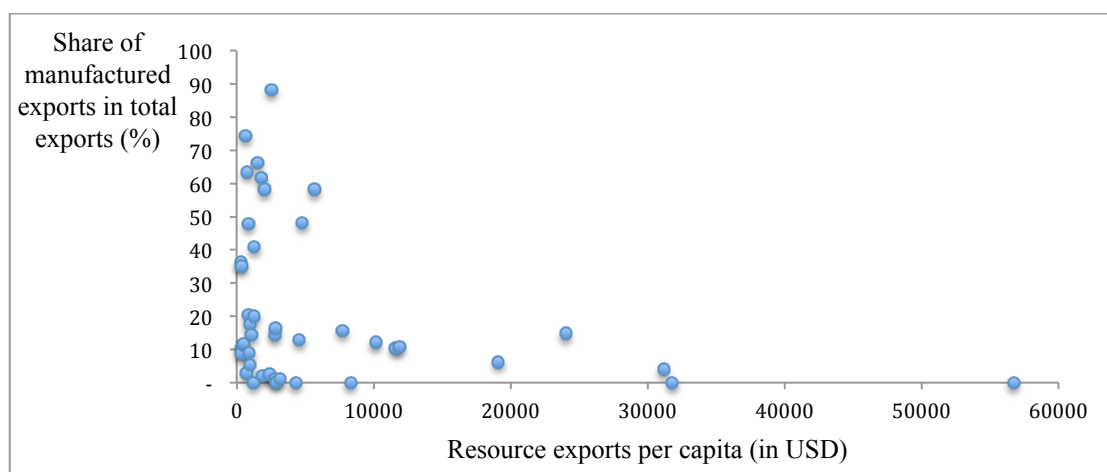
Source: O'Sullivan Rey and Mendez (2011)

⁷³ Economic diversification contributes to expand job opportunities for the segments of labour force that are not employed in extractive sectors and consequently may also bears societal effects in terms of inequality. Statistical analyses were conducted as part of this thesis to study the impact of export diversification on inequality. The preliminary results show that diversification is negatively correlated with inequality, but were not included in the final version of this thesis due to the lack of systematic data across countries.

⁷⁴ This includes countries like Qatar, Norway, Kuwait, the UAE and Australia, which are usually considered high-income economies. However, it can be argued that the economies of Qatar, Kuwait and UAE are not necessarily advanced because they have lower levels of industrial and agricultural development than other high-income countries (Khan, 2007).

⁷⁵ They consequently conclude that for the most extreme resource-based cases, openness to trade would tend to be high and the overall effect would therefore be a U-shaped relationship between resource intensity and trade openness.

Figure 16: Manufacturing exports in total exports in resource-rich countries in 2012



Source: World Bank (2019) and UN Comtrade (2018)

In conclusion, as Gelb (2010:19) writes: “although there is evidence that diversifying economies can expect to do better over the long run, the urgency of the issue will vary across countries. Contributing to this view, this chapter has shown that resource abundance per capita is an additional factor that influences the suitability of diversification strategies pursued by resource-rich countries. Indeed, it appears that MRR and VRR economies thus face a differentiated sense of urgency and risk-taking for structural transformation at the expense of financial diversification. VRR countries can afford growth rates, social distribution and high per capita income without a productive transformation of their economy. However, such circumstances are “particular” and cannot be replicated by most other countries. MRR countries can reap more benefits from diversifying their productive structures as swiftly as possible. Such differences influence the trade offs underlying resource revenue management decisions, especially in terms of the difference in opportunity costs of investing resource revenues in financial assets.

4.3.4 Institutional measures can mitigate the political risks associated with domestic investments of resource revenues

While the risks associated with public resource revenue investment are extremely important and sometimes cannot be eliminated, it should be stressed that they are not unavoidable and that several measures exist to mitigate them (see Gelb et al., 2014a; Gelb

et al., 2014b). A government's ability to spend revenues and allocate resources effectively is affected not only by the level of institutional development prior to extractives production, but also by political factors that come into play once (1) public expectations of a new flow of extractives revenue are raised and (2) a state–business elite has developed on the basis of rent capture (Lahn and Stevens, 2018). However, attention needs to be given to the governance capabilities that states needed to have to implement industrial strategies effectively (Khan, 2003). The literature on managing resource revenues has often featured a static view of the trade off between the risks and benefits associated with the domestic investment of resource revenues. However, as in the context of growth strategies more broadly, the rent-seeking costs have to be set against the gains (ibid.). In addition, if it is true that governments lack the capacity to invest domestically, what makes them more likely to target project and invest overseas more efficiently than domestically? It can be argued that government can also poorly target investment opportunities overseas (unless they entrust the management of the funds to international fund managers but the country characterized by bad governance and poor institutional capacity might be the least likely to give up control of its resource revenues). More attention should thus be given to the accountability mechanisms and benchmarks that can help ensure that resource revenues are managed productively.

This section discusses different institutional ways to reduce the risks of elite capture, such as evaluation and monitoring mechanisms, corporate governance rules, and co-investments with a variety of actors to ensure accountability.

4.3.4.1 Evaluation and monitoring: ex ante, ex post, vertically and horizontally.

Social and commercial cost-benefit analyses are important to avoid while elephant projects. As put forward by Collier et al. (2010), avoiding elite capture requires both honesty and efficiency, which can be enforced in multiple ways, either ex ante (about how decisions get authorized) or ex post (evaluation). In addition, monitoring and evaluation mechanisms can derive from top-down authority, bottom-up pressure from citizens and their representatives, civil society groups, as well as norms internalized by the public sector workforce (ibid.).

Efficient evaluation and monitoring also require transparent reporting. SWFs permitted or mandated to invest domestically should thus issue publicly available reports covering their activities, assets, and returns, as well as allow to be audited both internally and externally (Gelb et al, 2014a). While all funds embody “vertical accountability” (reporting to the government), some also mandate “horizontal accountability” to a wider audience, by making information on balances, earnings, deposits and withdrawals publically available or by sharing decision-making power among a range of interest groups independent of the government (Gelb and Grasmann (2009). In Norway, although the fund is administered by the Central Bank, decisions on transfers must be approved by parliament, while in Indonesia, because of the lack of ‘horizontal’ transparency, vertical accountability alone proved insufficient to prevent kleptocracy (Gelb and Grasmann, 2009). In Algeria, the lack of horizontal transparency also enabled the depletion, within two years, of the *Fond de Regulations des Recettes*, which accumulated USD 32,5 billion, to finance the government budget (Le Matin d’Algerie, 2017). Increased transparency reduces the risks of elite capture, increase accountability and may be implemented by government who may be concerned that they will be followed by governments that are prepared to loot accumulated funds (Collier et al., 2010).⁷⁶

4.3.4.2 Corporate governance

The sole creation of resource funds alone is neither necessary nor suffice to sustain good macroeconomic management, since funds can be subverted and captured when the institutional environment is weak (Davis, et al., 2003; Gelb and Grasmann, 2009). Setting up appropriate benchmarks is thus necessary to ensure the integrity of investment decisions (Gelb et al., 2014a). Corporate governance is the system of rules and practices by which a firm is managed. It involves balancing the interests of a company's stakeholders, management, government and the community (Shailer, 2004). There is a large body of knowledge on corporate governance but in the context of this research, the independence of the board from political interference is particularly relevant.

⁷⁶ The Extractive Industries Transparency Initiative (EITI) is an example of global standard for the good governance of oil, gas and mineral resources. The EITI Standard requires information along the extractive industry value chain.

In order to improve the efficient management of resource revenues, and similarly to the case of regulation of extractive sectors (see footnote 124), scholars have often emphasized the separation of the state (as well as national development banks and SOEs) from resource revenue management (e.g. Gelb et al, 2014b). On the one hand, while government officials often serve as board members for state-owned entities, combining ownership and supervisory roles presents conflicts of interest that could undermine the integrity investments and lead to political capture (ibid.). Nominations committees as well as board members should comprise individuals that meet specific skills and experience requirements and that are deemed to be objective, which can contribute to ensure a politically independent selection process, although perfect independence can hardly be achieved when the owner is the state (ibid.). For instance, civil society representatives sit on the Petroleum Oversight Committee in Sao Tome, while spending decisions in Kazakhstan and Azerbaijan are essentially those of the President (Gelb and Grasmann, 2009). In Alaska and Norway, the management of the resource funds has been delegated to bodies that to a large degree are independent from politicians (Torvik, 2011).

On the other hand, it could be argued that the protection of resource revenue management from government inference is not necessarily always desirable. First, separating resource revenue management from the state seems unrealistic because countries with weaker institutions are likely to be the ones that do not set up reforms to limit the prerogatives and control of corrupt leaders and the state over resource revenues. Second, one could argue that markets alone fail to deliver diversification objectives and that resource revenue management should be linked to broader industrial policy objectives, as determined by the state, in order to foster complementarity, rather than being managed in isolation to policy objectives. In addition, domestic public investments are not only commercially minded but also carry a social mandate, with an allowance for lower returns as a trade-off for public utility (Ross, 1999; Cammet et Diwan; 2016; Gelb, et al. 2014). Nevertheless, because social returns are often difficult to measure, the allowance for lower returns has allowed for corruption, cronyism, lobbying from special interests

and political agendas to distort public investments.⁷⁷ As a result, strong benchmarks and guidelines should be put in place in order to define the allowance for investments of resource revenues that carry a social mandate beyond sole profits.

4.3.4.3 Co-investments

Gelb et al (2014a) argue that co-investing with private investors, pooling with other SWFs, and co-financing with international financial institutions could be used by SWFs to reduce risk of influence by political and lobbying pressure, bring in additional expertise, and enhance the credibility and integrity of the investment decision. While this option may be suitable in some instances, it seems unrealistic to be a systematic approach for all investments in capital scarce developing countries where revenues available for investment are mostly resource revenues that accrue to the government. In addition, SWFs might be willing to undertake the investments in projects with large social and economic externalities that private investors might not invest in. In addition, if a SWF were to invest according to purely commercial market principles, it could run the risk of simply displacing private investors, which is why SWFs should seek development opportunities with close-to-market financial returns in areas where it can crowd in, rather than displace, private investors (Gelb et al., 2014a).

4.3.5 A Developmental Approach Towards Investing Resource Revenues

4.3.5.1 Overview

In light of the need for domestic investments in resource-dependent economies, there has been a revival in efforts to rethink the trade-off between resource revenue investments in financial assets overseas and real assets domestically. However, such efforts still feature a static approach to the trade-offs underlying resource revenue management. For instance, Berg et al. (2012) developed a useful model to analyze the macroeconomic effects of investing natural resource revenues and proposed an investment approach that combines

⁷⁷ For instance, governments in oil rich countries have often used oil rents to buy popular support before elections through consumption subsidies, white elephant projects and other wasteful spending, rather than socially efficient projects (Robinson and Torvik, 2005).

raising public investment and saving some of the revenues in a fund. Nevertheless, this model treats public investment inefficiency, absorptive capacity constraints, weak tax systems and Dutch disease, as pervasive features in developing countries. The model also considers that investment efficiency does not improve over time, because it assumes that its underlying factors (such as institutional and governance quality as well as administration and managing capacity) can take a long time to improve.

In contrast, this section addresses resource revenue management in the context of diversification objectives by offering a novel approach (or more exactly, by bringing back an “old” approach rooted in early structuralism) geared towards using resource revenues to overcome domestic structural constraints (such as low technological sophistication, limited areas of comparative advantage, low absorptive capacity) as well as mitigating economic risks associated with resource revenues (such as public investment inefficiency, absorptive capacity constraints, and Dutch disease).

This approach is dynamic across time, space and institutional conditions. It is dynamic across time because it emphasizes the gradual shift between short-term fiscal stabilization and long-term progressive accumulation of productive capabilities in tradable sectors. The ‘space’ element relates to the consideration that resource rich countries may have different needs for domestic investments according to their diversification rate, level of resource abundance per capita, size of labour force and current gap in infrastructure and human capital capabilities. This approach is also dynamic across institutional conditions because it takes into account the state policy actions to improve the institutional capacity to invest over time. Indeed, this approach acknowledges the endogenous relationship between state capacity and growth by taking into account how certain patterns of resource revenue investment can contribute to building state capacity over time.

The main features of this approach are: (i) the gradual scaling up of domestic investments in real assets; (ii) the focus on specific capabilities needed for targeting tradable sectors in order to reduce commodity dependence and macroeconomic instability on the long run.

4.3.5.2 *A gradual scaling up of domestic investments in real assets*

There is a wide academic literature on public investment efficiency. For instance, Pritchett (2000) argued that public investment in many developing countries is not inherently productive because inefficiency, waste, or corruption, often distort the impact of public spending on capital accumulation. Some studies such as Petrie (2010) and Rajaram et al (2014) also have looked at the role of public investment in ‘transforming resources into assets for growth’ and focused on the role of institutional capabilities in ensuring efficiency of public investment management. However, these studies do not concretely inform us about how to design public investment and simply assume that high institutional capabilities will ensure the design and implementation of ‘good’ policies.

Collier et al. (2010) and Collier and Laroche (2015) argue that countries should invest in their capacity to invest *before* domestically investing their resource revenues to ensure that public investment leads to high returns in terms of growth. While this is a very sensible argument, the question that remains is: how do government increase their capacity to invest? Such arguments (often used against domestic resource revenue spending) rely on the assumption that it takes a long time for countries to develop good institutions and absorptive capacity (building up government administrative capacity, addressing bottlenecks in the economy, investment in education and skills), which means that public investment is likely to be inefficient in the meanwhile and cause economic distortions. However, one element of great importance that might be shadowed in such approach is the presence of opportunities for learning by doing.

In contrast, Gelb and Grasmann (2009) argue that the allocation for domestic investments, rather being fixed at a certain portfolio share, should be determined on the basis of competition by being weighted against the potential returns on overseas investments. Hence, when domestic returns are low, investment would be channeled abroad. This would safeguard the efficiency and high returns of investments, while investment with a ‘developmental’ purpose can still be benchmarked against the financial return on foreign assets. While this approach bears a lot of benefits and safeguards, it may not be suitable in terms of taking into account the ‘strategic’ and social value of certain investments over others, not only domestically but also abroad, and potential

synergies between domestic and overseas investments. Indeed, overseas investment can be linked to strategic domestic industries and thus should be measured not only in terms of their financial returns but also in terms of their economic impact and value creation domestically. For instance, SWFs can be a means to acquire technology that could help promote the industrial upgrading of domestic industries, as well as acquire distribution channels through strategic acquisitions.

More importantly, it can be assumed that low-return yielding investment may be initially required in order to build competitiveness and increase the returns on domestic investments on the long run. Indeed, low domestic rates of returns can reflect the lack of dynamism or opportunities in a national economy but could also be the result of several bottlenecks that could be alleviated or because of lacking or aging infrastructure. In cases where domestic investments hold low returns because of bottlenecks that relate to infrastructure or human capital availability, determining domestic allocation of investment on the basis of competition with foreign assets would lead to stagnation and preservation of the status quo. Instead, initial transformational investments may then be needed to increase the marginal productivity of subsequent capital investments.

Departing from existing suggestions, this thesis suggesting a policy alternative consisting in the gradual scale up in the domestic allocation of investments from resource revenues, which can allow for building the capacity to invest through learning-by-doing as well as progressively expand the absorptive capacity of the national economy. Indeed, it can be argued that public investment efficiency involves some degree of learning by doing in developing the technical expertise and institutions required for project appraisal, selection, implementation, monitoring and evaluation, and so on.

By capping the allowance for domestic spending in the first few years of a commodity boom, potentially wasted revenues or the “damage” cause by inefficient investment is restrained. Indeed, scaling up public investment too much and too fast could subject the economy to more instability, lower investment efficiency, and higher depreciation rates, without the guarantee that such strategy would outperform a more conservative scaling-up path (Berg et al., 2012; Gelb and Grasmann, 2009). In contrast, gradually localizing the investments of resource revenues takes into account the diminishing marginal utility

of public spending and the issue of absorptive capacity. The progressive increase in the allocation of investment domestically can also allow for the domestic economy to gradually adjust its supply side capabilities in order to absorb larger volumes of capital, thereby reducing risks of crowding out, both in terms of capital and skilled labour.^{78 79}

In addition, this gradual approach reduces the cost of misjudging the duration of a commodity boom. Indeed, policy-makers have also often misjudged the nature of the boom, which can lead to high costs and inefficiency (Gelb and Grasmann, 2009). Policy makers may overspend revenues in the first years of what is perceived as a long commodity boom, but such commodity boom may turn out to be short. By gradually investing resource revenues domestically, policy makers avoid overspending in the case of a short boom but also ensure that investment have also accrued domestically in the case of a long boom. This approach consequently enables to safeguard short-term macroeconomic stability in the context of oil price volatility. Gelb and Grasmann (2009) have attempted to identify the size of fund that might be required not to fully smooth domestic spending, but to maximize a benefit function in which there are diminishing returns to spending. They find that, in the case of the short boom (which usually last less than five years), the optimum is to spend 20% of incremental oil revenues during the boom years and save the remaining 80%. For the long boom, it is optimal to spend 80% of incremental oil revenues and save the remaining 20% (ibid.), because over-saving resource revenues in low risk financial assets overseas bears a high opportunity cost in the long run. As a result, the savings rate should gradually decrease to around 20% over time, as the commodity boom prolongs, making way for other types of investments.

The trade-off between financial investments and real investments is thus dynamic overtime and the policy priority should shift from fiscal stabilization towards capital

⁷⁸ Crowding-out does not only refer to the fall in private sector spending and investment caused by higher government spending, but also to the skilled and specialized labour or resources that might be monopolized by government investments (for instance, limited supply of resources and labour for activities such as wealth fund management or the construction sector).

⁷⁹ For instance, the gradual recruitment of skilled labour in a SWF may lead to higher competitiveness of the labour force, in contrast to the immediate recruitment of a large number of employees. In contrast, the excessive delay in investing domestically would also prevent local professionals from acquiring experience managing resource revenues.

accumulation in productive sectors to stimulate diversification on the long run. Given that it is difficult to estimate the duration of commodity booms, the option of gradually allocating more resources to domestic investments reduces the risks of overspending resource revenues accumulated in a short commodity boom but would not delaying the reconfiguration of the domestic economy.⁸⁰

4.3.5.3 Emphasis on specific capabilities needed for targeting tradable sectors

Although increased government spending can generate demand pressures on non-traded goods, leading to a real appreciation and a decline in traded-good production (van Wijnbergen, 1984), efficient public investment can also raise productivity in non-resource tradable sectors, counteracting Dutch disease symptoms (Berg et al., 2010; Cherif and Hasanov, 2012, 2014). Over time, resource revenues can indeed be used to relax capital and technological constraints, especially in non-mineral resource sectors, in order to promote the diversification of productive structures. Export diversification would contribute to long-term macro economic stability, even more so than the prescribed short-term fiscal stabilization through the saving of resource revenues overseas. This argument is in line with the idea that macroeconomic policies are not enough to solve macroeconomic problems.

Several scholars have examined the desired degree of verticality in the public investment of resource revenues. Collier et al. (2010) argue that the dangers of crowding out and Dutch disease can be offset by public spending designed to increase the competitiveness of private sector investments and that is complementary to private sectors activities (such as improvement of infrastructure and human capital). Nevertheless, a sole focus on the ‘capacity to absorb investment’ offers no guarantees that the economy will be able to diversify and productively "develop" rather than merely "grow" while remaining resource-dependent. Indeed, relying on already existing market structures and simply enhancing private sector activities might be unlikely to lead to diversification.

⁸⁰ Such rule would not necessarily oblige states to invest all their domestic allowance but would only constitute a cap. It is thus not systematically incompatible with the suggestion by Gelb et al. (2014a) to allocate domestic investments in competition with external assets.

The debate on absorptive capacity can be enriched by taking into account the Cherif and Hasanov (2012) study of the optimal consumption, saving and investment policies of oil exporters. This study concluded that the tradable sector plays a paramount role in investment-saving dynamics and that developing countries may need to pursue a purpose-specific set of policies to develop tradable sophisticated sectors rather than rely solely on providing an “enabling environment” in which a sophisticated export sector would spontaneously emerge by itself. However, enhancing the productivity of the tradable sector is not just a matter of marginal returns to private capital because the mechanisms to enhance productivity can be interpreted more broadly. For instance, technological acquisition and economic diversification can be factors of enhanced productivity in the non-resource tradable sector of a resource rich economy. Cherif and Hasanov (2012:18) also argue that productivity increases as a resource abundant economy become more diversified, which sheds light on sequencing concerns: It is not only a matter of improving productivity to diversify, but also of diversifying in order to improve productivity and absorb investments. These concerns highlight the need for a transformation of productive structure and call for a broader and more complex consideration for the role of public investment of resource rents in orienting market incentives towards a diversification of the tradable sector.

The need to focus public investment in the non-resource sectors becomes even more justified in the context of resource dependence. As Arezki (2011) suggests, government in resource-rich countries should increase their revenue mobilization in the non-resource sector, through taxation, for instance. He rightly points out that increasing non-resource-sector revenue mobilization would deliver other benefits, including combating volatility in government revenues by diversifying the sources of government revenues. However, Arezki (2011) focuses on revenue mobilization *from* the non-resource sector, instead of resource mobilization *towards* the non-resource sector, in contrast to Cherif and Hasanov (2012). This distinction matters because before being able to increase revenues from taxation of non-resource sectors, unless there are already pre-existing sources of revenues from dynamic non-resource sectors (which is by definition not the case in resource-*dependent* economies), governments first need to stimulate new sources of revenue generation in non-resource sectors.

4.4 CONCLUSION

This chapter has contributed to reframe the challenge of resource-based development in the context of productive diversification and contributes to an existing discussion that departs from the mainstream literature and conventional policy advice. The conventional wisdom is that countries should deal with fiscal volatility associated with commodity prices through diligent fiscal rules to offset boom-and-bust cycles and by investing resource revenues in financial assets abroad. However, the way resource revenues should be used depends on several factors that are country specific. The factors that influence to urgency to invest domestically include the existing gap in infrastructure and human capital, the current level of export concentration, as well as the level of resource abundance per capita, as evidenced in section 4.3.3. As a result, the standard growth advice that resource rich economies should pursue financial diversification by investing resource revenues in financial assets overseas may be suitable for some resource rich countries (such as Norway, the UAE or Equatorial Guinea), but may not be suitable for MRR countries that still require to undergo export diversification in order to develop and generate employment.

Current discourses on resource wealth management indeed lack a holistic vision of resource revenue management in the context of productive structural transformation. Stabilization funds and fiscal rules can at best mitigate the symptomatic effects of commodity price volatility but do not address the root causes that make a country vulnerable to resource earnings fluctuations. The critical issue for public investment in resource-dependent countries is therefore the sustainable diversification of the productive matrix to generate new sources of foreign exchange instead of statically maximizing rents from existing income streams. In this perspective, this chapter has adopted to dynamic approach to managing resource revenues in order to lay out several policies that can ensure the efficient investment of resource rents towards productive capacity building, including institutional measures (such as evaluation and monitoring and corporate governance mechanisms) and investment strategies, such as the gradually scaling up of domestic investments and the focus on non-resource tradable sectors.

PART II:

COMPARATIVE STUDY

Chapter 5:

Resource revenue management in Chile and Malaysia

5.1 INTRODUCTION

This chapter examines the fiscal linkages that arise between extractive sectors and the rest of the economy by explaining how copper and petroleum revenues are respectively managed and re-invested in Chile and Malaysia. In Malaysia, petroleum accounted for about 30% of total exports at its peak in the 1980s (UN Comtrade, 2018). Petroleum revenues translated into high domestic investment levels and imports of machinery and equipment for industrial sectors. In Chile, copper revenues have represented around 50% of export revenues in the past decade (ibid.), but have mostly been managed in the context of a fiscal stabilization agenda. Chile is often put forward as a success story of fiscal management of copper revenues due its successful countercyclical fiscal policy and macroeconomic stability. However, this chapter argues that such fiscal stabilization agenda was followed at the expense of financing for structural transformation.

5.2 MANAGING PETROLEUM REVENUES IN MALAYSIA

5.2.1 *Overview*

“Most oil producing developing countries do not have the expertise nor capital to extract oil and have to invite international oil companies. Those countries then collect the royalties. But in the case of Malaysia, we decided that we cannot be satisfied with only collecting royalties and we must have the capacity to exploit our own resources. We have to acquire the technology. The first phase was the collection of royalties and the use of that capital to invest in our capabilities [thus maximizing fiscal linkages]” (Prime Minister Mahathir Mohamad, Personal Communication, 7 April 2017).

Malaysia's oil exports had become the nation's top foreign exchange earner around 1980 (Gale, 1981). Malaysia's case features revenue management practices that are oriented

towards achieving structural transformation and diversification objectives. In fact, during most of the period 1970-98, and in contrast to Chile, Malaysia's overall fiscal management had been characterized by very high fiscal deficit as a proportion of GDP but most importantly for public investments that had transformative effects on the export basket in the long run (Di John, 2009). The World Bank (2013) also argues that Malaysia's impressive economic performance is closely tied to its sound management of natural resource revenues and that Malaysia is one of the few countries that has followed the Hartwick rule, according to which the value of (net) investment needs to equal the value of rents on extracted resources at each point in time (Hartwick, 1978). Malaysia has indeed converted natural wealth into productive capital assets (namely infrastructure, machinery, human capital and institutions) that supported economic diversification towards manufacturing and services. As further shown in this section, oil and gas revenues in Malaysia have been mostly spent domestically, either through re-investments by Petronas (the national oil corporation), government expenditures or subsidies.

5.2.2 Composition and fiscal importance of resource revenues

Oil and gas revenues that accrue to the federal government consist of royalties, petroleum tax, export duties, and dividends from the state-owned company, Petronas.⁸¹ In the period 1988-2012, the Malaysian government raised approximately RM615 billion (around USD150 billion) in petroleum revenues.⁸² The largest portion of these revenues goes directly into the federal government's budget. A smaller share goes into the budget of producing provincial states, while Petronas retains a significant portion of its profits to undertake investments, domestically and abroad. Over the years, Petronas has grown into one of the largest and most profitable companies in the world, and remains the single-largest contributor to the country's revenue. Since its creation in 1974, Petronas has paid RM403 billion (around USD103 billion) to the government, comprising more than half of all government revenues in that period (Centre for Public Policy Studies, 2017).

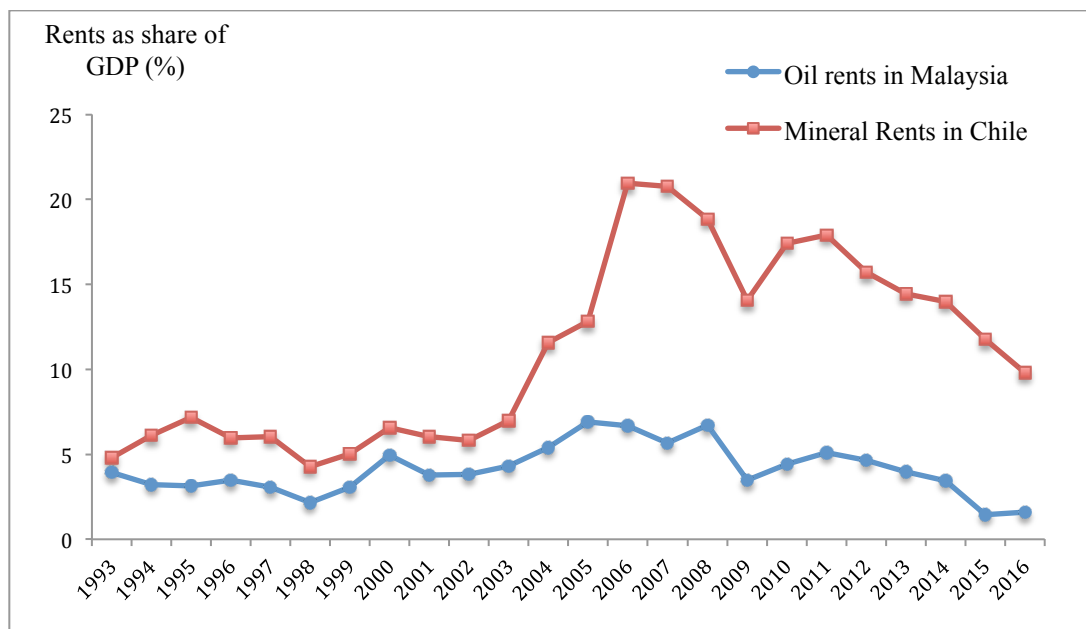
⁸¹ The Petroleum Tax Act imposed a company tax rate of 38% for the petroleum sector while regular company taxes are 28% in Malaysia (US Department of State, 2001).

⁸² This figure includes RM231 billion in petroleum income tax, RM333 billion in dividends from Petronas and RM51.7 billion in royalty payments (World Bank, 2013).

The dependence of fiscal revenues on oil revenues had declined between 1980 and 1998, but the trend reversed with the commodity price boom in the 2000-2014 period. Petroleum revenues have indeed accounted for as much as 45% of government income in 2012 before falling back to 22% in 2015 (CIA, 2018). Oil revenues also tripled as a percentage of GDP between 1995 and 2010 (see World Bank, 2019). As a result, the World Bank (2013) argues that since 2000, while Malaysia continues to feature among the few countries that follow the Hartwick rule, it is moving towards greater resource dependence and lower investments in excess of natural resource rents, similarly to Chile.

However, it might be too hasty to draw conclusions on Malaysia's increased commodity dependence. Despite an increase in oil revenues between 2000 and 2014, Malaysia has in fact managed to moderate its dependence on oil rents especially in comparison to other resource rich countries such as Chile. As shown by figure 17, oil rents as share of GDP in Malaysia have been decreasing since reaching a peak of 7% of GDP in 2008. In addition, this peak coincided with the global financial crisis, which probably induced a drop in GDP that caused a disproportionate increase in the share of oil rents in GDP.

Figure 17: Oil and mineral rents as share of GDP in Malaysia and Chile (1993-2016)



Source: World Development Indicators, from the World Bank (2019)

5.2.3 How resource revenues are spent

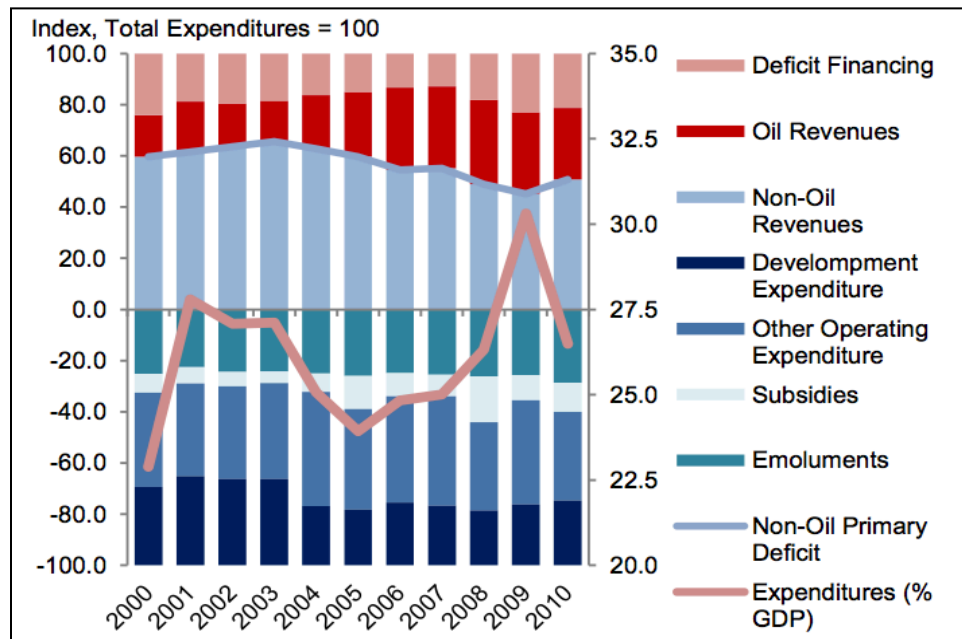
The share of the revenues allocated through the annual budget are primarily spent on development projects, although there is no exact way to calculate how much oil revenues feed into specific projects because revenues from all industries are "pooled" together, meaning that oil and gas revenues are not differentiated from revenues from any other industry (Yeoh, 2008; Centre for Public Policy Studies, 2017). The Federal government then decides how to manage and divide the revenues into three broad areas: expenditure (both recurrent and investments), subsidies, and savings.

5.2.3.1 Expenditure

A share of the government's annual budget is allocated to expenditure for national development, whether in specific projects or general capabilities such as education provision. However, in the absence of exact information and broken-down data on sources of government revenues and government spending in different development projects, we can only speculate on the specific effect of resource wealth on development financing. Nevertheless, as detailed in figure 4 and in subsequent sections of this chapter, because of the high level of subsidies and tax incentives to promote manufacturing sectors (including resource-based industries) from the 1970s until the 2000s, one can deduce that one of the fiscal linkages between the Malaysian oil sector and the rest of the economy is through the spending and reinvestment of oil rents through subsidies towards prioritized sectors, especially manufacturing and resource-based industries. As further noted by the World Bank (2013) and the National Economic Advisory Council of Malaysia (2010), investments in infrastructure and human capital have been partly financed from natural resource revenues (export duties on tin, palm oil and rubber and later petroleum), which provided an important backdrop to horizontal diversification. This is perhaps a case of 'subsidizing' industrial development through resource revenue management. Indeed, given the reliance of government's annual budgets on petroleum revenues, it is reasonable to believe that the Malaysian government would have been in a much more difficult financial situation to grant generous subsidies and tax breaks to promote manufacturing sectors had it not benefited from petroleum rents over the last

forty years. Figure 18 shows that around half of expenditures (including development expenditures) have been financed through oil revenues in recent years.

Figure 18: Share of oil revenues as a percentage of expenditures



Source World Bank (2013)

5.2.3.2 Savings

A small portion of oil and gas revenues (about USD25 million a year) also goes into the National Trust Fund, also called Kumpulan Wang Amanah Negara (KWAN), in which they are earmarked for future investments and savings. The KWAN was set up in 1988 with the purpose of securing national wealth for future generations in the face of the depletion of Malaysia's hydrocarbon reserves.⁸³ It is under the direct control of the Prime Minister's Office.⁸⁴

⁸³ The contributions to the KWAN consist mostly of revenues from Petronas and were initially allocated through Petronas' annual budget. In 2011, the contribution modality was amended and Petronas consequently contributed annually based on a strata that depends on the Weighted Average Realized Price of oil per year (World Bank, 2013; Tordo and Anouti, 2013).

⁸⁴ In terms of oversight and control, KWAN's is mostly governed by a panel of trustees led by the Minister of Finance and thus is independent from the Parliament. The World Bank (2013) argues that this is a weak form of governance because although submission of ex-post accounts of

As of 2008, the fund had about RM3.8 billion (USD1 billion). Despite its objectives and its thirty-years existence, the size of the KWAN appears to be rather small, especially compared to similarly purposed funds set up even more recently in countries with comparable mineral resource export intensity per capita, such as the Kazakhstan National Fund, the Russian National Welfare Fund, Chile's Social and Economic Stabilization Fund and Pension Reserve Fund, or Algeria's Revenue Regulation Fund. It is thus highly doubtful that the KWAN disposes of sufficient funds to cushion the country from external financial blows in the long run (World Bank, 2013; Yeoh, 2008).⁸⁵ The World Bank (2013) consequently argues that more petroleum revenues should be invested through the KWAN rather than Petronas, which should restrict itself to overseeing the operational management of the oil and gas industry.

Despite some remaining degree of dependence of government income on petroleum revenues, the Malaysian government recognized early on the need to cultivate a mixture of industries. The policy option chosen to deal with the dependence and depletion of petroleum resources seems to have been industrial diversification instead of fiscal stabilization alone.

5.2.3.3 Subsidies

A substantial amount of Petronas revenues from oil and gas also goes into subsidising various petroleum products (primarily petrol, diesel and gas). Fuel subsidies expanded from 0.1% as share of GDP in 1990-1994 to 2.1% in 2010-2012 (World Bank, 2013). Petronas also makes large contributions to gas subsidies. In 2007, Petronas subsidised the gas sector at a cost of RM19.7 billion while the government's expenditure on petrol, diesel and gas subsidies that year stood at RM16.2 billion (Centre for Public Policy Studies, 2017). Table 5 shows that Petronas' contribution towards gas subsidies between 1997 and 2012 represented around RM108.5 billion (equivalent to around USD26billion).

KWAN is provided to the legislature, this does not easily allow decisions to be reversed

⁸⁵ Although the petroleum revenue has grown significantly over the 2000s, KWAN's assets accounted for only 0.6% of nominal GDP in 2012 and the percentage share of KWAN over the Government's petroleum revenue remained below the 1% percent range (World Bank, 2014).

Table 5: Potential revenue foregone from Petronas' contributions towards gas subsidies

Subsidies by Petronas	2011 (in RM billion)	Share in GDP	Cumulative amount (1997-2012)
Power sector	11.6	1.3%	108.5
Non-Power Sector (including industrial, commercial, residential users and natural gas vehicles)	8.5	1.0%	46.4
Total	20.1	2.3%	154.9

Source: World Bank (2013)

It is doubtful whether such consumption subsidies are sustainable in the long run, or whether social redistribution could take place more effectively through developmental projects that target more specifically the poorer segments of the population. Indeed, fuel and gas price subsidies (although conditional on consuming fuel or gas) are mostly untargeted, channeling scarce public resources to both wealthy and poor individuals. They distort consumption incentives and lead to higher energy consumption, with attendant detrimental environmental implications (World Bank, 2013).⁸⁶ However, it is generally agreed that reforming subsidies is generally politically sensitive. Consequently, the gradual replacement of fuel price subsidies towards more targeted transfers would require minding political economy considerations.⁸⁷

5.2.3.4 *The role of PETRONAS in re-investing resource revenues*

After paying dividends to the government, Petronas also retains between 25% and 50% of its oil and gas revenues, which it reinvests in different segments of the oil and gas supply chain as well as in petroleum-related sectors and non-petroleum-related sectors such as car manufacturing and property development.⁸⁸ In fact, Petronas' assets, revenues and

⁸⁶ Retail prices of both petrol and diesel in Malaysia are among the lowest within the region. From 2000-2010, final consumption of petrol grew by 4.1% per annum, but imports expanded at a faster rate of 5.5% per annum reflecting the difficulty of domestic sources to meet higher demand. In 2010, approximately 45% of motor gasoline demands were met through imports. The trade position for motor gasoline and diesel has deteriorated over the past decade. This trend is expected to continue, especially if prices remain subsidized (World Bank, 2013)

⁸⁷ According to the IMF (2013:1), successful subsidy reform requires "an extensive communications strategy, supported by improvements in transparency, such as the dissemination of information on the magnitude of subsidies".

⁸⁸ Such revenues would not be captured in the MINDEX (see chapter 3), which excludes revenues that is retained by SOEs.

capital expenditure respectively represent more than 50%, 30% and 6% of GDP, and accounts for a significant amount of domestic investment (IMF, 2015).

Petronas' responsibility of managing and reinvesting the petroleum revenues it retains partly explains its diversification in different activities (Nordas, Vante, and Heum 2003). Indeed, Petronas has re-invested its revenues in activities such as refining, processing, petrol distribution and sales, maritime transportation services, marine and heavy engineering, manufacturing of petroleum products such as chemicals and fertilizers, as well as real estate with the management of the Kuala Lumpur City Centre project. For instance, Petronas invested USD1.6 billion in building the Petronas twin towers. While the such project has at times been labelled a white elephant, it appears that it had considerable externalities since it increased the real estate value of Kuala Lumpur's city centre and contributed to promote tourism, which is now one the first sources of foreign exchange generation in the country. Petronas' other non-oil sector activities have also raised some controversy. It has bailed out firms that the government considers strategically important in several instances.⁸⁹ Although Petronas had argued that those operations were commercially motivated, it appears that the company has incurred losses on them and the claimed synergies related to these acquisitions are not obvious (ibid.).

Because of its mandate and significant resource-revenue investments, it can be argued that Petronas has in some instances played a similar role to a resource fund (World Bank 2013).⁹⁰ It has provided some insulation to the budget against volatility in oil prices, especially in the 1980s, because the oil prices change were only partially transmitted to the budget (ibid.).⁹¹ Petronas has also contributed to the management of resource revenues by avoiding to repatriate some of its revenue back into Malaysia when the country was experiencing appreciation of the real effective exchange rate (ibid.).

⁸⁹ For instance, it rescued Bank Bumiputra by taking 80% of its stakes and bailed out the national car manufacturer, Proton, in the aftermath of the Asian financial crisis.

⁹⁰ According to the IMF (2012b:31), the objectives of resource funds are (i) savings: to transfer wealth across generations or across time; (ii) stabilization: to insulate the economy from volatile commodity prices; and (iii) development: to allocate resources to socioeconomic projects.

⁹¹ The correlation between changes in oil prices and the annual variation in oil revenues was 59% between 1981 and 1990, which implies that only 59% of the change in oil prices was transmitted to the budget on average in that period (World Bank, 2013).

5.2.4 Impact on the local economy

I have attempted to calculate a rough percentage of fiscal revenues accruing back to the local economy by calculating and adding the share of revenues re-invested domestically by Petronas to dividends and petroleum taxes accruing to the federal government, provincial states, and funds channelled to the KWAN fund. It would appear that in 2013, total oil and gas revenues accruing to Petronas and the government and the KWAN fund represented about RM73.8 billion, of which 68% were invested and spent domestically.

In addition, while Khazanah Nasional Berhad, unlike Petronas, does not manage resource revenues and receives no ‘sovereign’ wealth per se, its initial capital injection (including the transfer of government-linked companies to its portfolio) can be understood as an indirect fiscal linkage from government revenues. Khazanah acts as a strategic investment fund that creates long-term value for the nation.⁹² It invests in innovation and technology abroad but also domestically to spur structural transformation and to create strategic value, understood both in terms of commercial profit, as well as potential for knowledge intensity, transformative effects, and spill-overs for the national economy.⁹³ In that regards it is very different from Chile’s sovereign wealth funds, which do not invest domestically.

⁹² At its creation in 1994, Khazanah’s initial objective was to manage and turn around SOEs that were underperforming. It transitioned from a sovereign wealth fund, towards a sovereign development fund, and more recently a sovereign venture fund (Speech by Khazanah’s Managing Director, 4 march 2016). Khazanah is now acquiring assets that can help develop Malaysia’s domestic capabilities. For instance, Khazanah opened offices in San Francisco and London to focus on IT sector acquisition and acquire microchip firms. Khazanah is also involved in two domestically owned E&E firms, Silterra (semiconductors) and Amulus (microchips). The corporate governance mechanisms in which Khazanah operates are very different from the case of the 1MDB fund, which has been plagued by scandals and alleged misuse of government funds.

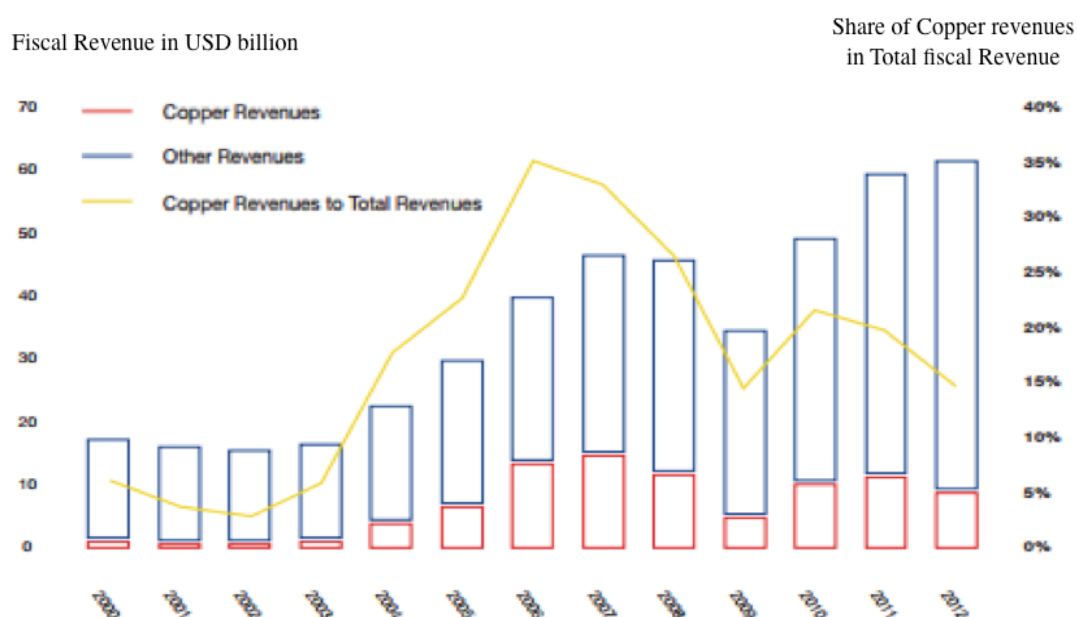
⁹³ As of 2017, almost 60% its investments were in assets in Malaysia while 80% of the companies in which Khazanah invests in are domiciled in Malaysia (Khazanah Nasional, 2017).

5.3 COPPER REVENUES MANAGEMENT IN CHILE

5.3.1 Overview

In Chile, the impacts of the copper sector are mostly seen in terms of the revenues it generates, part of which are appropriated by the government. As shown in figure 19, copper revenues reached nearly 40% of government revenues in 2006 (AfDB, 2017). The fiscal linkages consist of both royalties paid by mining companies, and dividends from Codelco, the state-owned mining company. Codelco was founded in 1976 and is involved in all stages of exploration, exploitation, processing, and sales of copper. Codelco is now the largest copper producer in the world, with close to 20% of the world reserves and 11% of world production (COCHILCO, 2010).

Figure 19. Composition of Fiscal revenues in Chile



Source: African Development Bank (2017)

How are Chile's copper revenues used and how do they affect other sectors of the economy? Since the 1980s, copper windfalls have mainly been used for fiscal stabilization and savings for future generations. The Copper Stabilization Fund was created in 1985. The copper price boom in the 2000s led to an increase in state revenues

and allowed the creation of three funds in 2006: the Economic and Social Stability Fund (ESSF), the Pension Reserve Fund (PRF) and the Innovation for Competitiveness Fund.

The PRF is essentially a savings Fund that receives between 0.2% and 0.5% of GDP, depending on the size of Chile's overall budget surplus each year (Ruiz-Dana, 2007). The Economic and Social Stabilization Fund (ESSF) replaced the original Copper Stabilization Fund and inherited its assets (of around USD5 billion). Its objective is to finance potential fiscal deficits, therefore avoiding the negative effects on government income associated with copper price volatility (Varas, 2012). Indeed, it is a fiscal stabilization fund that is mainly used to ensure intergenerational equity and to maintain a countercyclical policy by financing recurrent expenditures through the central budget using the returns from the stabilization fund's investments abroad (Eric Parrado, Personal Communication, July 2017).

The two sovereign wealth funds (PRF and ESSF) exclusively invest abroad in low-risk assets. Indeed, the investment policy of the ESSF emphasises risk aversion through an investment portfolio with a high level of liquidity and low credit risk and volatility. Indeed, as shown by table 6, the ESSF predominantly invests in foreign currencies and sovereign bonds. Around 34% of the ESSF's assets are allocated in money market instruments (15% in bank deposits and 19% in treasury bills), 55% in sovereign bonds, 3.5% in inflation-indexed sovereign bonds and 7.5% in equity outside Chile (Ministry of Finance, 2018). The PRF's portfolio composition as of 2012 comprised of 15% in global stocks, 20% in global corporate bonds and 65% in global sovereign bonds, while the currency composition of the funds is broken down as follows: 50% USD, 40% Euro, and 10% Japanese Yen (Korinek 2013; Ministry of Finance, 2018).

Both the PRF and the ESSF's funds are administered by the Central Bank and invested in international markets in low-risk instruments and consequently do not contribute to the local economy through domestic investments. While fiscal linkages could be an impactful investment mechanism between Chile's copper sector and the rest of the domestic economy, the use of resource revenues to promote transformation of the domestic

economy has therefore been rather minimal. Meanwhile, 10% of copper sales accrue to the army, as decreed by the Ley Reservada during Pinochet's military regime.

Table 6. The Economic and Social Stabilization Fund (ESSF)'s investment policy

Benchmark	Percentage of Total Portfolio
Sovereign bonds	55.0%
Barclays Capital Global Treasury: US 7-10 yrs.	26.5%
Barclays Capital Global Treasury: Germany 7-10 yrs.	11.0%
Barclays Capital Global Treasury: Japan 7-10 yrs.	10.0%
Barclays Capital Global Treasury: Switzerland 5-10 yrs.	7.5%
Treasury bills	19.0%
Merrill Lynch Treasury Bills Index USD	6.0%
Merrill Lynch Treasury Bills Index EUR	7.0%
Merrill Lynch Treasury Bills Index JPY	6.0%
Bank deposits	15.0%
Merrill Lynch Libid 3 Month Average USD	5.0%
Merrill Lynch Libid 3 Month Average EUR	6.0%
Merrill Lynch Libid 3 Month Average JPY	4.0%
Inflation-Indexed Sovereign Bonds	3.5%
Barclays Capital Global Inflation-Linked: US TIPS 1-10 yrs.	2.5%
Barclays Capital Global Inflation-Linked: Germany 1-10 yrs.	1.0%
Total Fixed Income	92.5%
Equity	7.5%
MSCI All Country World Index ex Chile	7.5%
Total portfolio	100.0%

Source: Ministry of Finance of Chile (2018)

Although it is often argued that copper has greatly contributed to the improvement in living conditions in Chile, it is difficult to quantify the impact of mineral revenues on human development through the increase in funding made available for social public expenditures (through the general government budget) and separate it from social development through the mining sector's growth (AfDB, 2017). Over the past two decades, several programmes, such as Chile Solidario (2002), Chile Crece Contigo (2006), and Pension Basica Solidaria (2008), were launched to provide social assistance, tackling extreme poverty, providing maternity care, and pensions for elderly and disabled people without social security.

However, even if Chile's social spending arising out of copper revenues might have had positive effects on vulnerable segments of the population, the country has not invested copper revenues to develop domestic industrial capabilities. In addition, when it comes to poverty rates and income distribution, Chile remains one of the most unequal high-

income countries, while poverty headcount ratio at national poverty lines (as a percentage of the population) has peaked at 25% over the last decade (World Bank, 2018). Chile's HDI loses around 20% of its value after it is adjusted to account for inequality rates, which would classify the country as a 'medium human development' following UNDP's HDI classification. There are thus valid reasons to remain sceptical of the impact of copper revenues on social development in Chile. In that perspective, Solimano and Calderon Guajardo (2017) argue that the Chilean copper revenue management case reveals high opportunity costs of over-investing in stabilization funds at the expense of social spending. Indeed, there is no clarity regarding the optimal level of resource accumulation in various stabilization funds with a possible tendency towards over-insurance in fiscal management (ibid). The ESSF, PRF, and copper-funded defence fund currently have assets of nearly 10% of GDP (which becomes 20% if we include the international reserves held by the Central Bank), while Chile's levels of public spending in education, health, pensions, and other social sectors as a share of GDP are consistently below those of the OECD and other Latin American economies of middle and large size, in a context marked by large income and wealth inequality (ibid.)

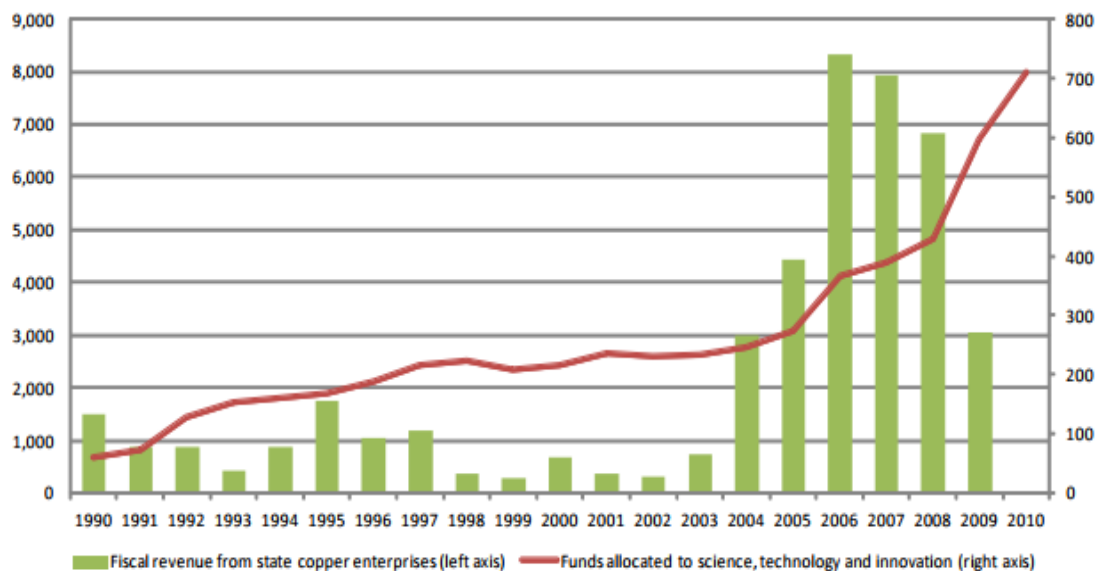
5.3.2 Fiscal linkages towards innovation and R&D?

Created in 2006, the ICF is the main state financing mechanism out of copper revenues for innovation and competitiveness. According to the current President of Chile's National Council for Innovation and Development (CNID), Gonzalo Rivas, (Personal Communication, July 2017), the Chilean government seeks to use copper revenues to fuel innovation and competitiveness, because only 0.4% of Chile's GDP has been devoted to R&D activities in recent years. This figure is very low compared to the OECD average (2.5%) and the Latin American average (0.8%), according to World Bank data (2018). In 2014, Chile's share of R&D spending as a percentage of GDP was also lower than other resource-rich countries such as Australia (2.0%) Canada (1.7%) and Malaysia (1.3%). In addition, according to the President of the CNID (personal communication, July 2017), R&D in resource rich countries tends to be driven by public spending instead of private spending, which would mean that the low R&D/GDP ratio of Chile is mainly due to government inaction. An explanation for that observation could be linked to the fact that,

although resource-based sectors involve sophisticated technology, the Ricardian rent is so plentiful that instead of developing technological capabilities in-house, there is little R&D investment and the core focus of the business is to take advantage of that rent. In addition, R&D involves a collective action problem. Hence, the reasoning behind the creation of the ICF is that the public sector should have a role in coordinating and funding R&D in order to compensate for the low private investment in R&D.

The ICF allocates funds to other government agencies, among which the most important are the National Commission for Scientific and Technological Research (CONICYT) and the Production Development Corporation's (CORFO) Innova Chile programme (together accounting for 88% of the ICF funding in 2013). Those programmes support innovation activities with high technological components (Varas, 2012). Figure 20 depicts fiscal revenues collected from state copper companies from 1990 to 2010, as well as the total funds allocated to the ICF for technology and science programmes.

Figure 20: Fiscal Revenues from State copper companies and revenue allocation to the science, technology and innovation programmes (1990-2010, USD million)



Source: Varas (2012)

Despite the claims that royalties from Chile's mining sector are being used for innovation in mining through the ICF, the use of copper revenues for innovation remains minimal compared to the channelling of copper revenues for fiscal stabilization to smoothen

general expenditures. Indeed, the funds channelled to the ICF for innovation purposes merely represent a twentieth of the copper revenues allocated to the ESSF alone. The ESSF remains the most important recipient of the State's copper revenues, with a market value of USD 14.7 billion in 2017.

5.3.3 A case of fiscal stabilization at the expense of structural transformation

While the fiscal stabilization objectives of the ESSF are laudable, they only offer short-term tools to address commodity price volatility if they are not accompanied by important mechanisms to re-invest resource revenues for export diversification.

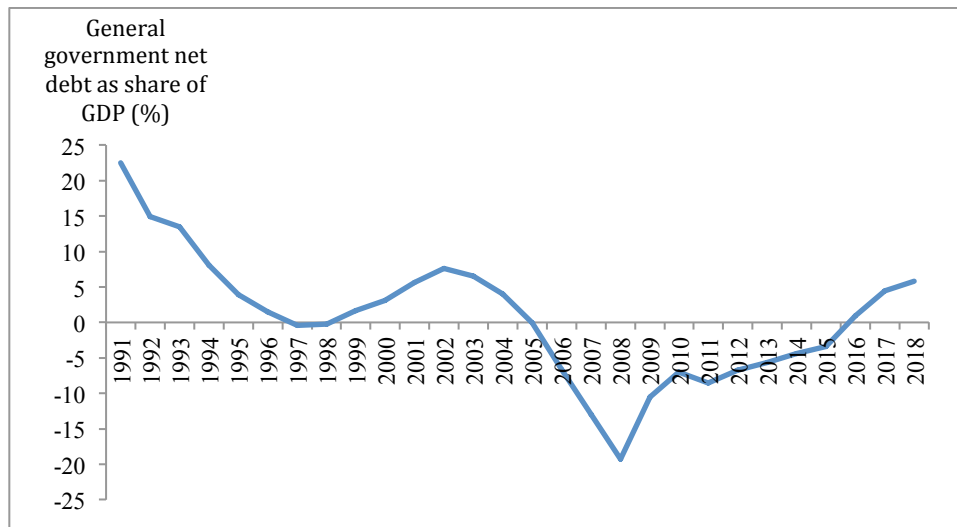
Chile's fiscal management of its copper revenues has been successful in regulating current expenditures since the 1990s, with an independent central bank, countercyclical monetary policy, flexible exchange rate, strong financial system monitoring. This has had an important impact on reducing medium-term volatility and financing the stimulus package to face the world recession in 2009, the earthquake recovery plan in 2010, and the medium-term financial sustainability of social policies (Korinek, 2013; Varas, 2012).

Nevertheless, Chile's fiscal management neglected the structural transformation agenda and mostly addressed symptoms of commodity price volatility rather than the root cause of commodity dependence. As a result, "Chile, seen as the economy that has successfully pursued aggressive counter cyclical fiscal policy to mitigate the effects of copper exports to its economy, saw a sharp rise in co-movements after 2007, in line with the huge rise in copper prices during the period" (World Bank, 2013:59). Four explanations can be put forward:

First, it appears that Chile's reputation for macro-stability acquired during the period of high growth between 1990-1999 can be directly attributed to high copper prices. Today, copper still represents over half of Chile's total exports (UN Comtrade, 2018). In fact, Chile's lack of economic diversification, exacerbated by falling commodity prices, along with bad income distribution (which is arguably another effect of Chile's lack of diversified productive structures affecting employment opportunities) constitutes a threat to fiscal stability itself. This issue is reflected in the recent decision by credit ratings

agency Standard & Poor's to downgrade Chile's credit score (Slattery, 2017). Chile's slow growth and fiscal deficit are a consequence of the dependence of its exports and fiscal revenues on copper prices. Indeed, according to the Superintendent of Banks and Financial Institutions of Chile, Eric Parrado, "instead of investing copper revenues domestically for structural transformation, successive governments in Chile have felt the pressure to save more than previous governments for political reasons but the other side of the coin is that they need to get debt to finance investments" (Parrado, Personal Communication, July 2017). Such trends are confirmed in figure 21, which shows that the government's net debt increased after despite the boom in copper prices since 2004.

Figure 21: General government net debt as share of GDP in Chile (1991-2018)



Source: International Monetary Fund (2019)

Second, Chile's lack of diversification exposed dependence not only on a single commodity, but also on one importing client, China. Given that China is the most important importer of Chilean copper, the possibility of China growing more slowly, in addition to the risk of copper prices going down, threaten the seeming macro-economic stability of Chile. This further reflects the idea that macroeconomic policies are not enough to solve macroeconomic problems.

Third, there is an asymmetry in the operation rules of Chile's stabilization funds, as pointed out by Solimano and Calderon Guajardo (2017:16):

“On the one hand, there are clear rules of accumulation; on the other hand, no rules exist for using the resources of these funds, say to counteract an economic downturn or recession [...] As of now, the decision of drawing resources from the SWFs depends on the discretionary judgement of the fiscal authority. In addition, it is not possible to track where the resources are finally spent (e.g. on consumption or investment), and therefore to evaluate the efficacy of countercyclical fiscal policies and some of their long-run effects.”

Fourth, similarly to the previous argument on the over-insurance in fiscal management in the context of lagging social spending, it can be argued that the Chilean case reveals a high opportunity cost of over-investing in stabilization funds at the expense of domestic investment for diversification. Indeed, while savings of copper revenues in financial assets represent nearly 10% of GDP (in addition to the international reserves held by the Central Bank which represent another 10% of GDP), Chile remains dependent to a large extent on raw copper exports while its gross fixed investment as share of GDP (21.56%) remains below the world average (23.32%) as well as Malaysia's rate (30.29%), according to IMF data (2019). In fact, Chile's investment as share of GDP did not even increase with the surge in copper prices since 2004.⁹⁴

5.4 CONCLUSION

The Chilean and Malaysian cases reveal two very different approaches to resource revenue management. In contrast to Chile where fiscal stabilization was prioritized at the expense of domestic investment, the bulk of oil and gas revenues in Malaysia go directly into the federal government's budget for investment on development projects and subsidies towards prioritized sectors, while Petronas also retains a large portion of its profits to undertake re-investments, domestically and abroad, in different segments of the oil and gas supply chains as well as in others sectors. Auty (1994) argued that while Malaysia made errors of promoting inefficient industries during the oil boom period, its

⁹⁴ Chile's investment as share of GDP represented 23.40% for the period 1981-2003 and 23.10% for the period 2004-2018.

concern to maintain sound macroeconomic management limited the damage. Nevertheless, Malaysia's development cannot be reduced to a concern for macroeconomic stability: Malaysia had a very high public fiscal deficit as a proportion of GDP during most of the period 1970-2000, which is in line with the World Bank's observations that Malaysian policy-makers seriously overestimated the resource available to undertake large scale, heavy industrial investments. It thus seems sensible to go beyond sole macroeconomic stability and fiscal deficit considerations, and raise the question as to why and how did public investment and spending have a long-term transformative effect in Malaysia.

The comparison between Chile and Malaysia shows that an overarching focus on macroeconomic stability and strategies to invest abroad, though they help address short-term fluctuations, can be detrimental to long-term development, if they do not contribute to the transformation of the domestic economy. The fiscal stability and the structural transformation agenda are not mutually exclusive. Conceptually, long-term structural transformation should be supported by fiscal stability and vice-versa. The challenge thus appears not whether to compromise one for the other but how to strike a balance between fiscal stability and domestic investments for long-term transformation. In Chile, it appears that the balance has been totally tilted towards fiscal stability: "policy choices to promote diversification are restricted by the neoliberal ideological barriers, relying on Mundell–Fleming price control measures, which were successful in the 1990s but have stopped being successful in the last decade" (Katz, Personal Communication, July 2017). While Chile is often put forward as a success story of resource revenue management, it seems that such success is at best limited to macro-economic stability considerations. Meanwhile, the successive Chilean governments' prioritization of macro-equilibrium may have shadowed the structural economic transformation agenda. As acknowledged by the Superintendent of Banks and Financial Institutions of Chile, "fiscal stability makes us more responsible but also leads to inertia" (Personal communication, July 2017).

Chapter 6: Vertical Integration in Chile's Copper sector

6.1 INTRODUCTION

The objective of this chapter is to examine the mechanisms underlying linkage development around Chile's copper resources. A report written by Ramos (1998) for the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) argued that Latin America in general and the economic development of Chile (and Latin America more broadly) needed a strategy that strengthens the linkages towards knowledge intensive activities around natural resources, supplying inputs, equipment and engineering services (backward linkages) and towards activities that process and use natural resources (forward linkages) without necessarily going against some of the obvious market trends. The development of suppliers of inputs, equipment and engineering services for mining extraction can indeed be one of the drivers to promote natural resource based industrialization, as witnessed in resource rich countries that are now highly developed and that have managed to overcome the resource curse, such as Canada, Australia, the United States and the Scandinavian countries, amongst others (Bravo Ortega and Munoz, 2015; Wright and Czelusta, 2002).

This chapter explains why the industrial fabric around Chile's copper is rather weak in comparison to those found in other resource-rich countries such as Australia and Malaysia, both in terms of downstream and upstream value addition. In light of this study, it becomes clear that the hands-off approach of the Chilean government was not successful in developing an ecosystem of knowledge-intensive industrial capabilities around Chile's copper sector.

The first section of this chapter discusses forward linkage development and its underlying political and economic challenges. The second section examines the development of local mining suppliers in Chile mining in order to shed light on the factors that influence backward linkages arising out of commodities.

6.2 FORWARD PRODUCTION LINKAGES IN CHILE'S COPPER SECTOR: TO SMELT OR NOT TO SMELT?

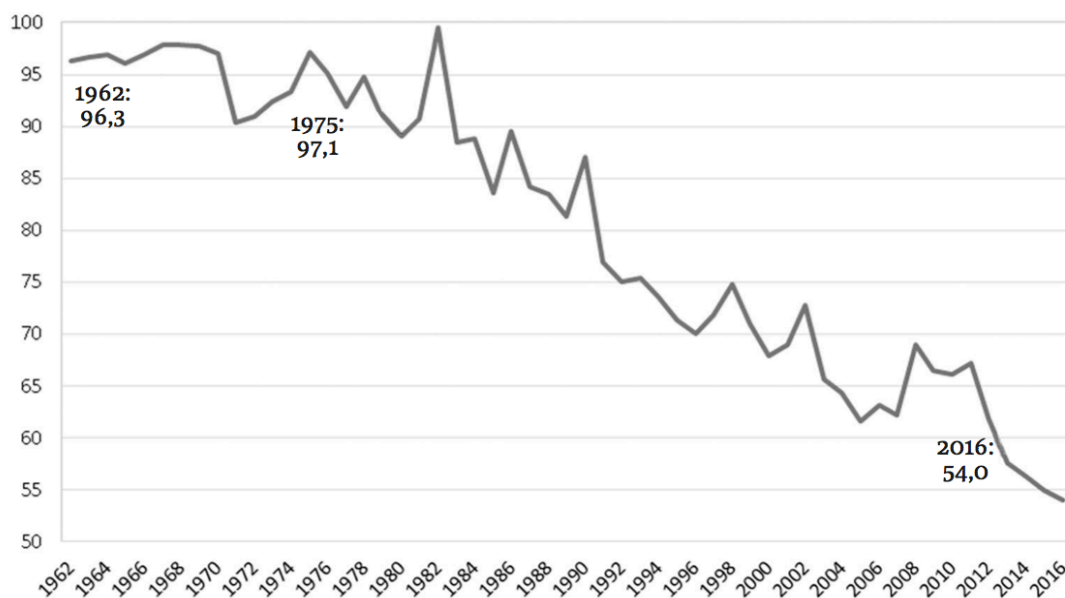
6.2.1 Overview

One hypothesis suggests that for effective copper-based development to take place, the copper sector must move beyond ore production by increasing the share of refined copper and ideally manufactured copper products (Korinek, 2013). There have indeed been growing concerns as to whether more value could be added to Chile's considerable copper reserves, which account for over half of the country's exports and which are the largest in the world (with a third of the global copper reserves).

One of the myths is that Chile's efforts to reduce its dependence to copper has resulted in its success in developing downstream linkages by refining and using copper in the production of wires and some other products. As Grosse (2009) writes "despite the major significance of copper in Chile's exports, the country has moved far beyond dependence on that natural resource by entering into downstream production of refined copper products". Nevertheless, it would seem that the data on which those arguments rely can in fact be traced back to a study conducted by ECLAC in the mid-1980s. Since then, as shown by figure 22, downstream production in the copper sector has considerably fallen, both in terms of refining and production of copper-based products. Indeed, the early interest for industrialization around copper in the late 1940s (championed by CORFO, which created MADECO, a copper manufacturing firm, and the Hernán Videla Lira foundry to refine copper), faded away since the 1980s (Correa, 2018). Nowadays, even though Chilean state-owned copper company Codelco owns three of the twenty largest copper refineries (Bell, 2016), refined copper represents less than half of Chile's exported copper, while the rest of exported copper is exported as raw copper or copper ore (UN Comtrade, 2017).⁹⁵

⁹⁵ These three facilities have a combined annual capacity of 1.5 million metric tons, which represents about 15% of the capacity of the largest twenty copper refineries worldwide. Four of the five largest refineries are located in mainland China (Bell, 2016). Out of 5.4 million tons of copper produced by Chilean mines in 2010, around 2 million tons were turned into copper

Figure 22: Evolution of the value of refined copper as a share of total copper exports in Chile (%)



Source: Correa (2018)

Why doesn't Chile invest in domestic smelting and processing capacity to create more jobs and business opportunities? In addition, a high proportion of Chile's refined copper exports are already refined into high purity metal ready to be manufactured into tubes, wires and other components required by a range industries. Yet, most of Chile's copper is exported across the Pacific without much value addition and is reimported in the form of manufactured goods and more sophisticated copper products (Azzopardi, 2011; OECD, 2015). Interestingly, neighbouring Latin American countries such as Brazil seem to be able to export sophisticated copper products and interestingly, "most of the copper processed from Brazil originates from Chile" (OECD, 2015:44).

Although some of the literature praises Chile's downstream value addition through the production of goods such as copper cables, tubing and sheet (See Grosse, 2009), downstream value addition efforts around copper in Chile do not in fact go far beyond primary processing. The beneficiation of copper has been rather limited, given that the production of copper cables merely accounted for around USD 300 million in 2015,

cathodes, around 1.6 million tons were smelted, leaving 1.8 million tons exported in the form of concentrates (Azzopardi, 2011).

which represents less than 1% of exports of the copper sector. Although Chile's domestic manufacturing industries utilize around 100,000 tons of copper each year, is it negligible compared to the 3.3 million tons of refined metal produced by the mining industry (Azzopardi, 2011). Madeco, a Chilean firm, was responsible for conducting downstream activities such as copper tubes manufacturing. Nevertheless, Madeco did not become competitive and recently announced that it will stop the production of copper cables (Nueva Minería y Energía, 2013). The reasons invoked for such decision were the increased costs and the adoption of substitute products - mainly based on plastic resins - in the market (Guerra, 2013). Hence, even though Chile has a clear comparative advantage in copper mining, operators in the country have not effectively engaged in the beneficiation of its copper resources into copper-based products.

6.2.2 Underlying factors explaining Chile's limited smelting and value addition.

The mainstream explanations to explain limited value addition in the copper sector focus on the low competitiveness of Chile's copper manufacturers because of a strong currency, relatively high wages and high energy costs stemming from the energy intensive nature of copper smelting.

Nevertheless, there are underlying historic and economic reasons that can help us understand the lack of value addition efforts around Chile's copper resources. As further explained below, alternative and complementary explanations include the short-term profit maximisation of extractive firms in Chile, combined with a dynamic inconsistency.⁹⁶ Such inconsistency relates to the fact that high copper prices discourage value addition while incentivizing copper ore exports. Other explanations could also include Chile's export dependence on copper ore demand from China, where most of the global refining capacity has been developed, leading to a clear market obstacle.⁹⁷

⁹⁶ A dynamic inconsistency is a situation in which the optimal plan of a decision-maker made at one point in time is no longer optimal later in time.

⁹⁷ In addition, copper smelting also has detrimental environmental effects, creating considerable emissions of pollutants, which notably forced Codelco to suspend operations in one of its site in 2011 after heavy contamination and leaks (AFP, 2011).

6.2.3 Short-term profit maximisation and ownership considerations

At the same time, there seem to be a lack of interest from mining companies to engage in value addition beyond raw material extraction. According to the President of Consejo Minero, a trade association bringing together domestic and foreign-owned private and public mining companies operating in Chile, firms in Chile should not be responsible for value addition: “Our business is to export raw materials. If another party want to process and refine Chile’s copper, we would be happy to sell it to them but we do not want to be involved in value addition” (Carlos Urenda, Personal Communication, 19 July 2017).

This short-term profit maximization approach at the expense of long-term investments can be partly explained by the historical political economy of mining in Chile. FDI in mining in Chile started a century ago by US companies seeking to extract the raw material for export to the US market and later to other world markets (Grosse, 2009). The mining sector was later nationalized in the 1970s but when Pinochet came to power in 1973, the sector was reopened to foreign investors, which were again looking for raw materials to sell to international markets. “Even in the 21st century, the copper industry in Chile seems to present an enclave kind of investment, where the foreign firms invest huge amounts of money in production facilities, but they then export the commodity raw material and have little additional impact on the domestic Chilean economy” (Grosse, 2009: 183). Even the large copper mines built in the 1990s, such as Candelaria, Collahuasi, Escondida and Los Pelambres, were financed by Japanese companies looking for a stable supply of concentrates for their smelters on the other side of the Pacific and thus had no interest in building new capacity in Chile (Azzopardi, 2011). There are thus historical reasons why Chile continues to export copper as ore without much downstream linkages for value addition.

A further question could be why Chile has been constrained in the low segments of the global copper value chain while countries such as Australia, Canada or the United States did not. Part of the answer may have to do with the structure of ownership in copper production. The mining sectors in United States Canada and Australia appear to be dominated by domestically-owned firms. In contrast, in Chile, even though Codelco had

been nationalized in the 1970s, it only produced about one-third of total domestic output by the 2000s, while a dozen foreign and domestic private firms accounted for the other two-thirds of total production (Grosse, 2009). Most of the foreign mining companies operating in Chile originate from Australia (BHP), USA (Phelps Dodge), UK (Rio Tinto) and Canada (Falconbridge), which are mostly mining countries. Meanwhile, Chilean mining companies have very little outward FDI and international presence with an extremely limited outward FDI and overseas activities apart from copper sales and distribution ventures (Grosse, 2009). Given such lack of internationalization and outward orientation, can we really talk of a success of copper-based industrialization in Chile?

6.2.4 The influence of global commodity prices on value addition decisions.

The lack of interest from mining companies to engage in value addition beyond raw material extraction can also be explained by global copper prices fluctuations. The copper price boom since the early 2000s has made raw copper exports profitable while discouraging value addition for the production of copper-based goods, which became less cost competitive in the market. In fact, rather than benefiting from high copper prices, firms such as Madeco are witnessing reduced demand in consumer copper-based products as consumers switch to cheaper alternatives such as plastic and aluminium.⁹⁸ The International Copper Association, the marketing arm of the global copper industry, estimates that high prices have reduced demand for the metal by as much as 8% in recent years (Azzopardi, 2011).

In addition, the reduced demand for the manufacturing of copper-based products has been accompanied by an increase in the supply of copper refining capacity globally. In accordance with the law of supply and demand, recent considerable investments in smelters in Asia have created an excess smelting capacity worldwide leading to making smelting a marginal business while raw copper sales have become extremely lucrative. During the first six months of 2011, Codelco's Ventanas smelting and refining complex in central Chile barely broke even (Azzopardi, 2011).

⁹⁸ The adoption of substitute products, mainly based on plastic resins, has been invoked as a reason for the discontinuation of Madeco's copper cables manufacturing production.

6.2.5 China's copper ore demand restrains Chile's leverage in terms of domestic value addition

Chile's dependence on Chinese copper imports is another important factor to take into account. China accounts for 40% of global copper demand but also has interests in refining and adding value to copper domestically. As mentioned in the above section, considerable investments in new smelters in Asia, and more particularly China, have created an excess of smelting capacity globally. Indeed, the growing competition from copper refineries in China, which now has the biggest copper refining capacity in the world, is coupled with Chile's dependence to Chinese copper ore demand, which poses a barrier to increase the domestic processing of Chile's copper exported to China. Those conditions render Chilean copper ore production beholden to terms dictated by smelters in China and may contribute to explain why Chilean actors might be reluctant to promote value addition to the country's copper resources.

6.2.6 Increasing demand by diversifying markets and applications of copper?

In face of the main challenges that are undermining downstream copper-based manufacturing, some firms in Chile are pursuing opportunities related to new applications, using some of the copper's lesser known properties, such as antimicrobial properties (Azzopardi, 2011). Coldeco, through its subsidiary INCuBA (Innovaciones en Cobre S.A.), aims to increase demand for copper, generate more markets and business opportunities for higher value-added copper-based manufacturing by targeting sectors such as garment, fish farming and health. It has recently partnered with Cobre Andino and Chile's largest sock manufacturer, Monarch, to launch the production of clothing made of antibacterial copper fiber (Mineria Chilena, 2014; This Is Chile, 2011).^{99 100}

⁹⁹ Cobre Andino is a Chilean mining company that produces Copper Sulphate Pentahydrate for fertilizer, algicide, fungicide, and animal nutrition.

¹⁰⁰ The adoption of antimicrobial copper for border control booths at Chile's Arturo Merino Benítez Airport can also be seen as part of governmental effort to promote different application and value addition of copper.

6.3 BACKWARD PRODUCTION LINKAGES

6.3.1 Assessment of Chile's mining supply industry: strengths and limitations

Although the number of Chilean mining suppliers has recently increased from 3.443 firms in 2007 up to 5.998 firms in 2012 (Fundación Chile, 2012; 2014), various assessments reveal that these firms they are stagnating when it comes to knowledge intensive and innovation activities (Urzúa, 2011, 2012). Around 97% of mining suppliers classify as average or low capacity in the use of technology while there are no local suppliers operating at the knowledge frontier in mining (Bravo-Ortega and Muñoz, 2015). As Bravo-Ortega and Muñoz (2015:13) further explains, “most local suppliers operate in a context of production management and adaptation of available technologies, without achieving benefits derived from the adaptation of available technologies”. This may be related to the lack of conditions and incentives for local suppliers to innovate, as well as high level of competition from foreign suppliers, which constitutes an entry barrier to local suppliers. This is problematic given that greater participation of firms in technology and knowledge intensive activities is considered to be one of the key factors that will enable the growth of the Chilean mining industry as a source of technological development (Cochilco, 2009a; 2009b; CSiro, 2014; FCh, 2014; Urzua, 2011).

Alongside the broader comparison with the Malaysian case, contrasting Chile's experience with other extractive-led development experiences can be informative and puts Chile's situation into perspective. For instance, in Finland and Australia, domestic mining suppliers have become internationally competitive in the exports of mining technology (Bravo Ortega and Munoz, 2015; Korinek, 2013; Urzua, 2011). As shown by table 7, firms within the Australian Mining, Equipment, Technology and Services (METS) sector export around twenty times more than their Chilean counterparts, despite Chile also being one of the world top minerals producers. Mining supplies in Chile only represented 0.72% of total exports and 1.3% of mining exports in 2014.

Table 7: Indicators comparing Mining suppliers in Chile and Australia in 2012

	Australia	Chile
Total sales (in USD million)	90,000	20,000
Total exports (in USD million)	15,000	500
Exports as share of total exports of the mining sector	13.30%	1.70%
Share of the mining sectors in total exports	54%	60 %
Number of suppliers in the mining sector	1,500	6,000
Share of exporting suppliers	75%	6% ¹⁰¹
Number of suppliers that export more than USD 1 million (in 2014)	50%	1%
Share of suppliers whose exports represent more than 10% of their total sales	47	28

Sources: Compiled data from Austmine (2013), Bravo Ortega and Munoz (2015), Fundación Chile (2014; 2015); Meller and Gana (2015); Meller and Parodi (2017).

While the dynamic Australian METS sector only includes less than 1500 firms, around 75% of Australian mining suppliers are exporters. In contrast, in Chile, while the number of suppliers is four times higher than in Australia, only 6% of suppliers have completed export operations in 2012. Furthermore, only three firms (less than 1% of total suppliers) in Chile realized exports for a value higher than USD 1 million in 2012, far behind the Australian figure (50%). These three firms alone accounted for over half of Chile's mining supplies exports, as shown by table 8.

Table 8: Exports of suppliers in Chile's copper sector by size of exports in 2014

	Firms		Exports	
	<i>Number</i>	<i>%</i>	<i>Amount exported in USD million</i>	<i>%</i>
Exported more than USD 50 million	3	1%	275	51%
Exported between USD 25 mil. and 50 mil.	2	1%	53	10%
Exported between USD 1 mil. and 25 mil.	39	12%	165	31%
Exported less than USD 1 million	285	86%	44	8%
Total	329	100%	537	100%

Source: Fundación Chile (2015)

Consequently, although the participation of Chilean mining suppliers has been increasing, the level of exports, technological sophistication and knowledge intensity remains quite far from levels reached in developed resource rich countries.

¹⁰¹ There seems to be a mismatch in the data provided by Fundación Chile (FCh). FCh (2014) notes that 34% of suppliers exported goods and services in 2012 while data in other reports (e.g. FCh, 2015) notes that 345 suppliers exported in 2012, which represents only 6% of suppliers.

6.3.2 *Barriers to backward linkage development*

In Chile, there are no local content incentives or requirements as part of mining legislations or contracts regulations. On the one hand, according to the mainstream neoliberal view, the reason why Chile has not managed to build a competitive supplier industry around mining through free market conditions is simply because Chile may not have a comparative advantage in the supply of goods and services as inputs for mining production. According to a former Minister of Economy of Chile:

“Suppliers do not need state support to scale up because Chile has a sophisticated and fluid capital market and low interest rates. Hence, if suppliers did not become competitive and scaled up without state intervention, they do not have a competitive advantage in upstream activities of the copper sector” (personal communication, 2017).

On the other hand, another approach could emphasize the presence of market failures that prevent the localization of the supply of goods and services in the copper sector. It can be argued that state interventions are required to address some of the market failures inhibiting backward linkage development, especially given the considerable multiplier effect arising from the anticipated increasing global demand for copper. In addition, the fact that Chile holds a third of world copper reserves and the considerable internal demand for suppliers mean that there are enough economies of scales to seize current and future industrial opportunities stemming from copper exploitation through infant industry protection and learning by doing. Such business opportunities also arise from the increasing outsourcing of non-core business to suppliers, which now represent about 60% of the operating cost of mining companies (FCh, 2014).

Several local suppliers have been interviewed as part of this study in order to investigate obstacles to backward linkage development.¹⁰² The following section summarizes various

¹⁰² There are few instances of successful suppliers that successfully transitioned as top tier suppliers in knowledge intensive services, (such as Neptuno Pumps, producing water pumps; ENAEX, producing blasting devices; DRILCO, producing drilling tools; and AguaMarina, producing bio-mining equipment). These firms together account a large share of Chile mining suppliers exports and display high technological capabilities, international competitiveness, as well as the accumulation of transversal capabilities towards other sectors.

factors that contribute to explain the poor matching between mining firms and solutions developed by local suppliers.

6.3.2.1 Poor intra-industry dialogue and risk aversion behaviour

In a context where there are no incentives to encourage the use of local suppliers, multinational mining companies prefer to avoid risks and choose their established foreign suppliers to ensure reliability and continuity in their operations. Fieldwork interviews have hinted towards the spread perception of a managerial risk aversion attitude from mining company managers, including Codelco, the state-owned mining company. Risk-averse project managers favour the imports of supplies from established global providers rather than bet on collaborations with local firms seeking to integrate the supply chain. An explanation for such phenomena was put forward during an interview with Gonzalo Rivas, then-president of the National Council for Innovation and Development of Chile (CNID). According to him, employees and managers in the mining sector take advantage of an important Ricardian rent with high salaries. Their main purpose becomes to stay in the mining sector to take advantage of high salaries, which leads them to avoid taking risks nor making mistakes that could get them fired. As a result, large mining firms are not incentivized to risk adopting new technology and systems when it increases their cost only marginally even if it can have considerable externalities on the long run. This situation inhibits business opportunities for local firms and reduces the scope for learning by doing in order to reach the required time, quality and safety standards.

It appears that the risk-averse behaviour shaping intra-industry linkages is also the result of out-dated and rigid business relationships, in contrast to what is seen in countries such as Malaysia or Australia. According to Bravo-Ortega and Munoz, “firms with experience in foreign markets argue that -by contrast to Chile- abroad is easy to get engaged and keep in touch with customers or even related competitors through fluid relations” (2015:38). In a similar fashion, Patricio Meller (Personal communication, July 2017) emphasizes the importance of fluid government-industry linkages in Australia, in a context where most supplying firms are domestically-owned, enabling effectively communication between the state and mining suppliers in order to promote value addition

through backward linkage development.¹⁰³ In Australia, 84% of mining suppliers are domestically owned while foreign suppliers only represent 16% of firms supplying the industry (Bravo-Ortega and Muñoz, 2015). Locally-owned firms have developed domestic capabilities to produce various technologically sophisticated inputs for mining production. Such argument hints at the possible importance of the ownership for capabilities accumulation in the mining supply sector. According to Bravo-Ortega and Muñoz (2015:12), the path of development and innovation of local mining suppliers is related to the evolution in mining companies' ownership as well as the evolution of the demand for progressively complex services. They argue that while foreign-owned firms had no impact on the technological catching-up among local suppliers of services in the early stages of mining development in Chile, the situation changed with the nationalization wave in the 1970s, which led to incentives and expectations for local suppliers to collaborate with the state-owned firm, Codelco (ibid.). Codelco's vertical disintegration during the 1980's consequently allowed local suppliers to join the supply chains and increase their technological capabilities. Nevertheless, local suppliers still face risk aversion behaviours from even domestically-owned mining firms and have remained unable to compete with foreign providers from developed countries with accumulated knowledge and technological capabilities.

As a result of the lack of incentives for backward linkage development and the intense competition with foreign suppliers, many of the existing local suppliers have managed to integrate the copper sector either by going into niche markets with few competitors, or by leveraging previously accumulated manufacturing experience in other sectors.¹⁰⁴ Even then, it appears that marketing capabilities are key to earn trust from contractors. Despite several years of experience in the mining sector, Neptuno Pumps had been suffering from unstable contracts from one year to another in the absence of an established brand and before receiving international recognition through various awards.

¹⁰³ However, such fluid linkages have also allowed for revolving doors between mining companies and politics in Australia, which is argued to increase risks of conflict of interests and disclosure of privileged information (Waters, 2016; Transparency International, 2017).

¹⁰⁴ The bio-mining firm Aguamarina has even created the market for some of the applications of bio-mining solutions in the world, as for green tailings.

Local firms are not incentivized to conduct R&D activities through tax incentives or else. Neptuno Pumps has developed innovative solutions with little support from public instruments and relied on its own budget to fund their R&D. Aguamarina did not have its own capital to invest in research and relied on mining firms to fund their research without preferential terms, on the ground that such funding would reduce the costs of Aguamarina's products on the long run.¹⁰⁵ This example shows that some multinational firms (such as BHP) have in some instances bet on local innovators, despite the lack of government incentives to do so.

6.3.2.2 Obstacles to scaling up and testing of new products.

The scale of operations in the Chilean mining sector means there is very little time frame for learning by doing and for suppliers to scale up their operations. Firstly, the high cost of disruption of large scale and non-stop mining production constitutes an entry barrier to test new solutions and suppliers, who need to convince mining firms to disrupt their large-scale production processes to test new products.

Secondly, even once local products and solutions are adopted, firms need to scale up their operations immediately to respond to the industry needs, which may be challenging for SMEs. This is particularly problematic in Chile where two-third of total mining suppliers are micro- and small enterprises (FCh, 2014). The main difficulty faced by INGMAT (a Chilean firm supplying engineering services to the mining sector) when selling to mining companies is that they have no capacity for scaling up their solutions and no access to mining infrastructure to develop tests, which is why they prefer to generate prototypes and collaborate with others who escalate solutions (Bravo-Ortega and Munoz, 2015).

Thirdly, although Chile's banking system is highly developed there also seems to be a lack of complementarity between financing systems and the needs of the suppliers in the mining sector. "Chile has a highly developed banking system which has limited

¹⁰⁵ Aguamarina is notably the first supplier with whom BHP Billiton did not sign intellectual property or confidentiality clauses. BHP Billiton also internationalized Aguamarina as they are now using the biomining firm as a supplier in their operations in Australia. (CEO of AguaMarina, Personal Communication, July 2017).

knowledge of the mining supply business. It is thus hard for mining suppliers to get proper funding even they find innovative solutions” (Hernan Araneda, manager at Fundación Chile, Personal Communication, July 2017). Several governmental programmes, such as Innova, implemented by CORFO (the state production development corporation) and Fondef, managed by CONYCIT, have been created in recent years to fund and invest in local suppliers. Despite the fact that Aguamarina has obtained funds from these two programmes, it seems that an issue was the fact that the managers of those programmes did not necessarily know how to enhance the scalability of start-ups in the mining supply industry:

“It is not just about the financing but also about the knowledge on the process of scaling up: where to manufacture, how to package, in what quantities, at which prices, and where to outsource? This is a real issue because in the mining sector, where scaling up is not progressive, but goes from testing and pilot projects to large orders and immediate scaling up [...] This is a challenge for small firms” (Pamela Chavez, CEO of Aguamarina, Personal communication, July 2017).

6.3.2.3 Higher domestic sales discourage export orientation.

The low export orientation of local suppliers may point out an indirect relationship between the level of internal sales and the volume of international trade. Indeed, exports only represent between 1% and 10% of total sales for 72% of Chilean exporting suppliers (Fch, 2014). Exports therefore only represented a marginal income compared to sales realized in the domestic market for three quarters of the supplying firms in the mining sector. As Bravo-Ortega and Munoz explain (2015:8), firms with a volume of domestic sales above their sectoral average are less eager to export than those with internal sales below the average. The reverse effect can also explain the internationalization of Malaysian suppliers in the hydrocarbons sectors, where limited domestic scales required internationalization to maintain productivity.

Do large domestic scales incentivize suppliers to ignore international markets? The case of Australia and Norway shows that local suppliers in the extractive sectors became export-oriented despite the availability of large market scales and rents in the domestic

mineral extraction business. In addition, Chile's mining supply sales at home are still considerably lower than Australia, suggesting that the domestic sales of Chilean mining suppliers do not suffice to compensate for their lack of export orientation in comparison to their Australian counterparts.

Interestingly, when it comes to exports to other sectors, 35% of exporting suppliers mostly exported to other industries while 65% dedicated at least a share of their exports to the global mining industry (FCh, 2014). This tendency reflects the potential for transversal linkages in the supply of goods and services for copper mining, which can feed into other sectors.

6.3.2.4 The influence of commodity prices

Both high and low copper prices have discouraged the hiring of local suppliers, despite potential externalities and multiplier effects. On the one hand, when Chile's mining supply sector was about to transition into knowledge intensive business services (KIBS), high prices of copper led to increased revenues which delayed efforts to promote local suppliers. Large mining firms generated large profits and could afford to prioritize reliability by importing inputs. At the policy level, the state captured larger copper revenues, which contributed to focus policy attention on fiscal linkages arising out of the copper, at the expense of the policy interest to pursue backward linkages and value-addition domestically. On the other hand, in times of low commodity prices, lead mining firms generate smaller profits and are not incentivized to adopt new systems that would increase cost only marginally in the short run but could have considerable spillovers on the long run (some of which can benefit the lead mining firms, such as cheaper solutions that are adapted to the local context). In fact, lower copper prices led to lower returns which in turn led to the reduction of expenditure on engineering services from USD 400million to 300million in order to bring costs down and keep value in financial markets (Jorge Katz, Personal Communication, July 2017). This reduction in spending on local services impacts the long-term productivity of engineering companies supplying the sector, as well as leads to a loss of human capital and increase of unemployment of skilled labour, which is why it is a market failure (ibid.).

6.3.2.5 Shortage of skilled human capital

The shortage of skilled human capital is one of the most important factors inhibiting the participation and innovation potential of suppliers of goods and services in the mining industry. As shown by the firm surveys conducted as part of this thesis and in other works (e.g. Bravo-Ortega and Munoz, 2015), the suppliers who successfully developed capabilities and technological skills had to undertake internal measures and trainings to address the labour mismatches, or hire technical staff from abroad, in particular neighbouring countries. “Some universities in southern Chile are training fluids dynamics engineers but we usually would have to retrain the engineers we hire, at our own costs of time and capital” (Neptuno Pumps’ CEO, Skype interview, 9th march 2018). The need for such actions evidences poor university-industry linkages, whereby universities do not offer human capital formation related to the fields of development of local providers (Bravo-Ortega and Muñoz, 2015). Even *Becas Chile*, the government’s scholarship programme, does not discriminate in order to support specific strategic areas, which has resulted in the lack of human capital accumulation in engineering (OECD and World Bank, 2011).¹⁰⁶ This scholarship policy stands in contrast with Malaysia’s case, where Petronas directly sponsors scholarships in petroleum-related programmes domestically and abroad.¹⁰⁷ The recent World-Class supplier programme is an intervention attempting to solve this issue, as detailed in the subsequent section.

¹⁰⁶ The Chilean government sponsors investment in high-level human capital by funding scholarships to study abroad (Sinnott et al., 2010). There is no discrimination regarding the field of study for which the scholarships are available. While this programme aimed to promote the human capital accumulation required to build a knowledge economy, the ‘market allocation’ of scholarships resulted in a mismatch between the disciplines studied and domestic skills needs. Several experts and firms interviewed as part of this research complained that too little graduate students go into engineering fields, which is problematic because engineering capabilities are required to exploit and adapt modern technology in order to promote industrial upgrading (Former President of Fundación Chile, Personal Communication, July 2017). Technology-related areas have indeed received less than 10% of scholarships. In their review of *Becas Chile*, the OECD and the World Bank emphasized that the studies sponsored by the government should be related to the national priorities defined by the National Council for Innovation and Development (2011:15). The recently announced fellowship programme for foreign studies in engineering can be interpreted as an acknowledgement of the need for vertical approaches in education provision.

¹⁰⁷ In Malaysia, to counter the shortage for technical skills for science, information and communication technology, the government also set up TalentCorp in 2011 to attract Malaysian talent to return from abroad and to bring in foreign talent (Mukherjee et al. 2011).

6.3.3 Recent interventions

Some of the above-mentioned obstacles can be considered as market failures around Chile's copper sector and confirm the argument by Bravo-Ortega and Munoz (2015) that obstacles to innovation to local content in the Chilean copper sector relate to high transaction costs, considerable asymmetries of information, and excessive risks for local suppliers. In this context, the objective of promoting local suppliers in the mining sector has been increasingly pursued through different programmes in the past decade.

The World Class Supplier Programme, Valor Minero and the *Mineria de Alta Ley* programme, are recent interventions relying on public-private partnership to address the market failures -or what is termed as *bottlenecks* in Chile- that the mining industry needs to tackle. All three programmes are public-private partnerships that involve both mining firms (BHP Billiton, Codelco), government agencies such as (CORFO, CNID, COCHILCO) and Fundación Chile, a semi-public semi-private agency. These programmes aim to upgrade the number, export orientation, innovation capacity and technological capabilities of mining suppliers in Chile by 2020 and by 2035. Those interventions are thus clearly export-oriented because their common objective is to reach USD 10 billion of exports of mining supplies by 2035.

Interestingly, the World Class Mining Suppliers Programme (*Programa de Proveedores de Clase Mundial*) was initiated in 2008 by the foreign-owned mining firm BHP Billiton, whose motives can be understood by the need to have more reliable local suppliers to face certain local challenges. As emphasized by a manager at BHP Billiton, the increase of capabilities of local suppliers could help reduce costs on the long run and address tailored solutions to specific challenges and conditions (personal communication, July 2017). Even though BHP Billiton played a leading role in promoting this programme, it soon realized that it required public goods and participation of other mining companies in order to scale up the programme (ibid.). The subsequent involvement of other actors shows that addressing those challenges goes beyond the level of economic actors but also requires the involvement of state actors (government, universities) to provide public goods in the form of capital, incentives, training, testing facilities, and intra-industry

coordination. For instance, one of the initiatives as part of the World Class suppliers programme aimed to match university training with the current and future labour needs of the mining industry. Large mining companies did not cooperate with each other but Fundación Chile, a semi-public/semi-private foundation, was granted access to different mining companies payroll and future investment plans in order to elaborate a skills gap analysis and understand the qualifications that the sector needs, before coordinating with education providers in the country.

More recently, in 2017, in line with the National Commission for Mining and Development (COCHILCO) strategy, the programme was reformed and restructured into two main public-private initiatives. The programme is now known as *Programa de Innovación Abierta en Minería*, and is part of the broader Alta Ley National Mining Programme, led by the public agency CORFO and the Ministry of Mining (Navarro, 2018). The public sector has a more active role under the Alta Ley programme, whose objective remains to foster productivity, competitiveness and innovation in the mining industry and its suppliers, as well as to address environmental challenges (ibid.). Alongside the Alta Ley Programme, a public-private alliance named the Valor Minero, has also been established to promote the dialogue between the different stakeholders to discuss the include and sustainable development of the mining sector.

Such interventions are a clear recognition that the hands-off approach was not successful in developing an ecosystem of knowledge-intensive industrial capabilities around Chile's copper sector. It is perhaps too soon to assess whether those programmes will fulfill their objectives, but several observations can be made. Firstly, the implementation of the World Class Supplier programme seems to show promising results. As of December 2012, this programme was already working with 36 suppliers and was estimated to have a net value of USD121 million in savings on the cost of inputs, goods, and services, thanks to the innovations of the PPCM suppliers (Hidalgo et al., 2014; Navarro, 2018). The programme has been successful in achieving incremental innovations and it seems to have had a positive impact on exports. Between 2010 and 2012, the majority of mining suppliers experienced increase in their sales while new firms entered the sector (Bravo-

Ortega and Muñoz, 2015).¹⁰⁸ The goal of reaching 250 suppliers seems achievable, and the programme is almost half way towards reaching that target. However, further efforts are to reach the objective to export USD4 billion of mining supplies in 2035.

It is reasonable to assume that such programmes remain too shy and limited in scope to effectively address some of the persistent market obstacles preventing the development of local mining suppliers. A more active role from the public sector is needed to improve the availability of facilities for piloting, testing and the development of managerial capabilities for scaling up and internationalization (Navarro, 2018). Much further efforts are thus required in this direction. In Australia for instance, where METS comprises 7% of GDP and 7% of employment (much more than mining itself), there is a clear emphasis on supporting local firms' integration in the supply chain with a "hands-on" approach to increase the competitiveness of domestic suppliers, with different degrees of interventionism (Korinek and Ramdoo, 2017).¹⁰⁹ Some of the more aggressive local content policy tools also used in Malaysia's petroleum sector (as discussed in chapter 8) or in Australia's mining sector have not been implemented in Chile because of an ideological barrier. While in Malaysia there was a clear objective to add industrial value to commodities sectors already from the 1960s onwards, the objective in Chile was different and the priority was to attract investment to increase the volume of mining output (Official from the Chilean Productivity Commission, Personal Communication, July 26, 2017). "It is a pity we cannot capitalize on our mining sector and make the most of it because a lot of developmental and industrial policy tools cannot be used and this has to do with our history and ideology towards interventionist policies (ibid.).

In addition, Chile's policy space is already restricted by the high number of FTAs signed since the 1990s onwards. Chile's commitment to free trade renders it difficult for the government to put barriers to foreign competition and current approaches completely disregard balance of payment considerations. As a result, the impact of the World Class

¹⁰⁸ Unfortunately, I have not been able to access similar data (if such data exists) on the impact of the World Class Supplier Programme since 2012.

¹⁰⁹ Some of those policies aimed to align the education system with the demands of the industry. However, other more aggressive policies have been pursued to promote 'Buy Australia' and duty-free imports for firms that implemented a local content plan (Korinek and Ramdoo, 2017).

suppliers programme may be questioned. Indeed, while it appears that this programme targets challenges around copper extraction that are specific and tailored to Chile (such as the demand for environmental friendly solutions in copper mining, the decrease in copper grade, as well as shortages in water provision), nothing prevents such ‘Chilean’ challenges to be met by foreign rather than local solutions. In the meantime, the Australian authorities have already identified Australian firms whose capabilities relate to challenges in Chile such as water scarcity and have incentivised those firms to enter the Chilean market (See Australian Trade and Investment Commission; 2016, 2017).

6.4 CONCLUSION

The idea that linkages around natural resources where countries have a comparative advantage is a natural and organic process aided by market forces is contradicted by the Chilean experience. Despite decades of copper mining, leaving it to market forces, Chile has witnessed neither significant downstream value addition nor upstream linkages oriented towards higher value-added and knowledge intensive business activities. Meanwhile, as noted by the CEO of a bio-mining firm in Chile: “The most important thing about mining is not the copper, but the knowledge and technology that can be associated with it. Knowledge collection is the real value of the industry”.

Instead, long-term value added considerations in Chile have been trumped by short-term profit maximization behaviour. In recent years, the multiplication of interventions involving different types of entities demonstrate the growing recognition that the hands-off approach was not successful in developing an ecosystem of knowledge-intensive industrial capabilities around Chile’s copper sector. Whether such programmes feature sufficient tools to effectively promote copper-based industrialization remains doubtful.

Chapter 7:

Malaysia's vertical diversification in resource sectors

7.1 OVERVIEW

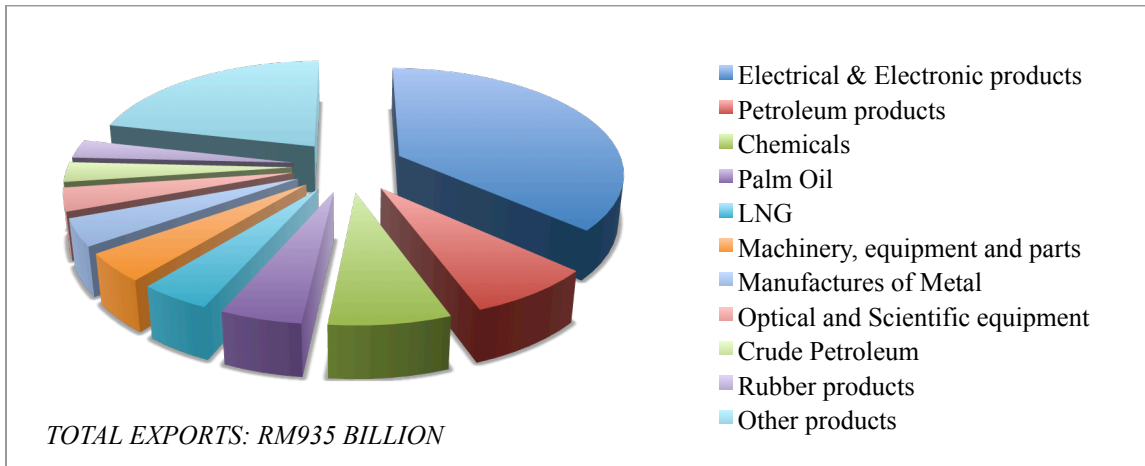
This chapter examines how Malaysia leveraged its natural resource endowment for industrial development. The debates surrounding Malaysia's development are not only dualistic in terms of the free market/industrial policy dichotomy, but also in terms of the resource/non resource-based sectors dichotomy. While the standard growth narrative attributes Malaysia's economic development to 'unrelated' diversification towards the electronics and electrical (E&E) sector, it can be argued that the contribution of resource-based industries also deserves particular attention. As noted by Professor Jomo:

“It is important to look at resource-based development because there are indeed different narratives regarding Malaysia's growth [...] The official narrative is that Malaysia experienced a switch in the 1970s to openness and foreign direct investment. There is some truth to this and an example is the electronics sector. The other story, which is less known, involves palm oil [...] and is rarely put forward because it starts with import substitution industrialization” (Personal communication, April 2017).

Despite the dominance of the E&E sector in the export basket (see figure 23), figure 24 shows that resource-based industries (which here only include palm oil, rubber-based manufacturing and petroleum products) have had a larger contribution to the country's trade surplus than the E&E sector over the past decade.^{110 111}

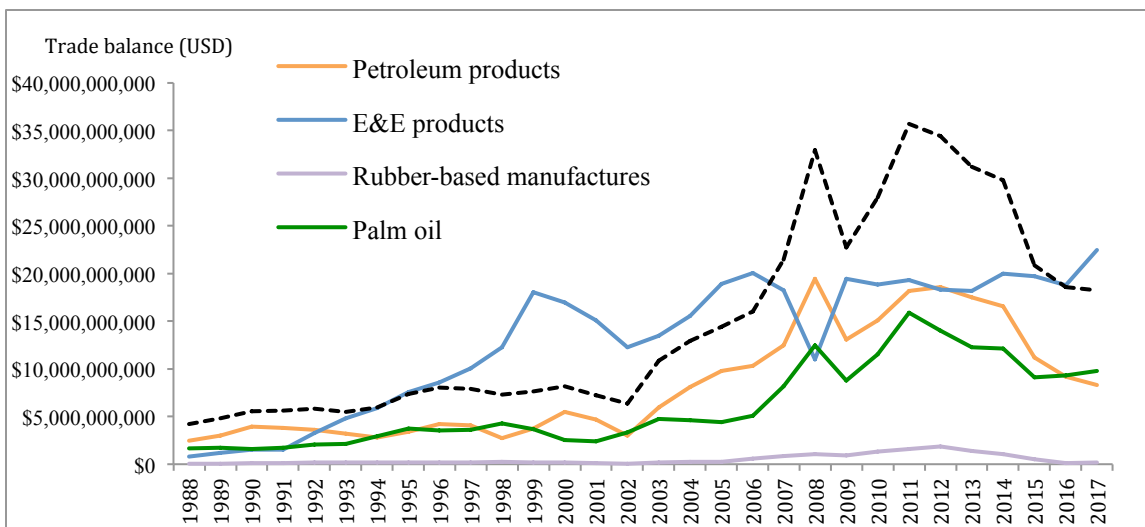
¹¹⁰ In order to fully measure and weight each sectors' contribution to domestic development, it would have been helpful to include indicators of value-added or employment by sector. In addition, if disaggregated data on employment was available on specific resource-based industries, it would have been interesting to compare the share of domestic versus foreign labour across sectors. Foreign workers account for between 20% and 30% of the workforce in E&E manufacturing (IMF, 2018a). However, official statistics tend to show data for the manufacturing sector as a whole without further levels of disaggregation. Other sources tend to single out the fast growing medical device sectors, which would overlap between the rubber and E&E industries, because it comprises of both rubber gloves and electro medical equipment. Trade data is consequently the most useful way here to compare the contribution of the different industries.

Figure 23: Composition of Malaysia's export basket in 2017



Source: Malaysia External Trade Development Corporation - MATRADE (2018)

Figure 24: Malaysia's trade balance by sector (1988-2017)



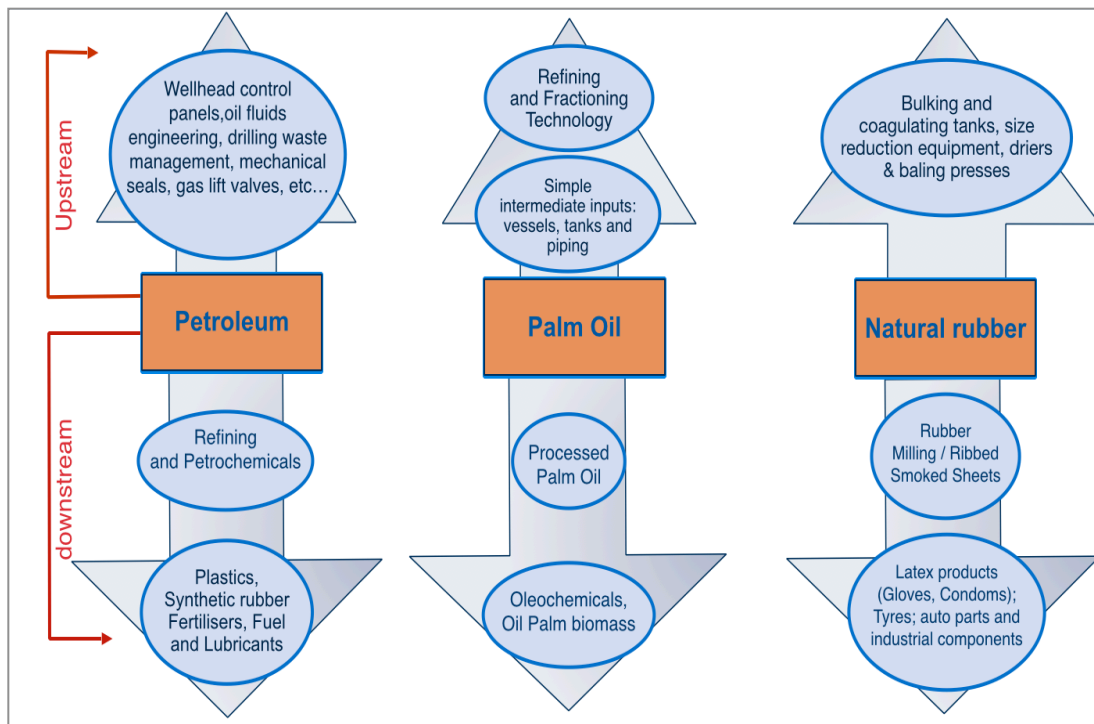
Source: UNComtrade (2019)

While academic research has been conducted on the petroleum (eg. Nordas et al, 2003; Tordo and Anouti, 2013), palm oil refining (eg. Khera, 1976; Moll, 1987; Gopal, 1999, 2001; Rasiah and Shahrin, 2006; Fold and Whitfield, 2012) and rubber-based industries (eg. Goldthorpe, 2015), these industries have less often been analysed together in the context of Malaysia's broader diversification.

¹¹¹ In 2017, palm oil- and rubber-based industries combined remained the largest net exporter and with a trade balance of RM100.8 billion, compared to RM90.1 billion for the E&E sector and RM36bil for petroleum (The Star, 2018).

At independence in 1957, Malaysia was heavily dependent on tin and rubber exports.¹¹² Rubber and tin were marked by low-priced elasticities of supply and uncontrolled variability in demand and supply (Goldthorpe, 2015), which led to export instability until Malaysia started to diversify its resource base towards the palm oil and petroleum sectors from the 1970s onwards. Malaysia has now evolved into a diversified natural resource-rich country located in the middle of a dynamic but resource-poor region in the world.¹¹³ Nevertheless, Malaysia did not merely rely on exporting its raw commodities but vertically integrated around those resource sectors in order to use natural resources as a motor of industrialization (see figure 25). In the 2000s, value-added in commodity-based manufacturing accounted for 12% of GDP, compared to 18% for raw commodities, while about half of all commodity-related exports were processed (World Bank, 2013).

Figure 25: Stages of value addition in three commodity sectors in Malaysia



Source: Author's elaboration

¹¹² In 1953 the export value of tin and natural rubber represented about 85% of all Malaysian exports, and accounted for about a fifth of the national income (IBRD, 1955).

¹¹³ It is worth point out that neither rubber nor palm oil are native to Malaysia, as they were brought by the colonial administration.

This chapter also informs debates on the influence of colonialism and laissez-faire policies on the resource-based industrialization process in Malaysia. On the one hand, scholars such as Jesudason (1989), Jomo and Edwards (1993) and Wheelwright, (1965) have argued that the laissez faire policies of the British colonial rule discouraged industrial development and value addition in Malaya because colonies such as Malaya were seen as source of raw materials to supply British Industry and provided a market for manufactured goods from the United Kingdom.¹¹⁴

On the other hand, other scholars argue that the laissez faire policies of the colonial rule laid out the foundation for the establishment of production linkages around resource sectors (Thoburn, 1973, 1977). This line of argument puts forward the high levels of technology transfer from western-owned engineering firms to local Chinese enterprises, through the subcontracting of manufacture and construction works (Thoburn 1977:201; Rasiah 1995:50) as well as the role of skills embedded in plantation labour that were transferable to manufacturing activities (Overton, 1994).¹¹⁵

This chapter contributes to these debates by focusing on the historical development of the petroleum, palm oil and rubber industries. In particular, this chapter evidences the key role of post-independence industrial policies in developing linkages despite high market barriers, contrarily to what had been anticipated by the neoclassical scholarship.^{116 117}

¹¹⁴ A further argument is that the British considered that manufacturing expansion would offer alternative employment for estate labour, which would in turn increase pressure on plantation wage rates, thus reducing their profitability (Wheelwright, 1965:97; Jesudason, 1989:48; Edwards, 1992:157; Jomo and Edwards, 1993:18).

¹¹⁵ While Thoburn (1997) sustains that rubber-tapping skills have little application outside the plantation sectors, Overton (1994) believes that plantation workers constituted a disciplined rural proletariat well suited to the demands of industrial sectors (Gopal, 2001).

¹¹⁶ The wood-based industry accounted for 2.8% of total country's exports in 2016 but it has not been examined in this chapter for length considerations.

¹¹⁷ In contrast to Chile's agriculture sector, most of those resources have been exported even before independence, which is why they are analysed in the context of vertical, rather than horizontal, diversification.

7.2 PETROLEUM SECTOR: MALAYSIANIZATION OF THE PETROLEUM VALUE CHAIN

Malaysia's hydrocarbon sector first emerged in the 1910s, with Shell's discovery of oil in the Sawarak region, but it was not until after independence that petroleum became a major sector in Malaysia. Malaysia is endowed with the world's 16th largest natural gas reserves and 26th largest crude oil reserves. It is the 9th natural gas exporter and the 25th largest oil exporter (CIA, 2018). As this section shows, petroleum resources have played a key role in the country's industrialization efforts through the establishment of upstream and downstream knowledge intensive activities.

7.2.1 *Overview of accumulation of upstream capabilities*¹¹⁸

Considerable local capabilities have been accumulated in upstream activities of the petroleum sector in Malaysia. While international oil companies initially remained the providers of upstream technology in the early periods of resource exploitation, especially given the context of Malaysia's technology-demanding offshore and deep-water fields (Tordo and Anouti, 2013), 74% of total value of contracts in upstream activities in the petroleum sector was granted to local companies by 1995 (Malaysian Plan, 1996).^{119 120}

Several domestic suppliers to petroleum operations in Malaysia have in fact emerged as globally competitive firms, operating in different regions and sectors (Klueh et al., 2009).¹²¹ Malaysia has for instance developed an indigenous shipbuilding industry to

¹¹⁸ See Lebdioui (2019a) for a more detailed discussion of upstream linkage development in Malaysia's petroleum sector.

¹¹⁹ For instance, Shell and Mitsubishi were fully carried out the technical development, sales and marketing of the Malaysia's first LNG plant (Nordas et. al 2003).

¹²⁰ The Malaysian Plan does not say how much of this value was generated by locally owned firms or by multinationals established in Malaysia (Nordas et. al 2003).

¹²¹ Some local suppliers have acquired transversal skills that contributed to sectors beyond the petroleum industry. For instance, Scomi provides oil fluids engineering and drilling waste management services, but that has also managed to develop globally competitive railway and nuclear centrifuge engineering capabilities. Such transversal skills have proved particularly useful after the collapse in oil prices in 2014, which incentivized Malaysian suppliers to mitigate their reliance on this sector.

meet the domestic demand for maritime equipment and services, that has also enabled the accumulation of capabilities that later went into the production of offshore equipment and platforms, which are mostly made of locally manufactured steel (Nordas et al., 2003).¹²²

7.2.2 Policy tools to Build Local Capabilities in the upstream Sector

The development of backward linkages in Malaysia's petroleum sector was the result of a mix of policy instruments. Some of the local-content-related policy tools in Malaysia derive from horizontal policies aiming to increase local participation in various industries, while many other instruments derived from vertical policies that have targeted upstream activities in the petroleum sector in particular. As summarized in table 8, the vertical local content policy tools have included legal and regulatory requirements, tax incentives, capacity-building programmes, and state-led investments through Petronas. The different policy tools employed for the achievement of local content objectives are summarized in table 9 and are further examined in the following pages.

Table 9: Overview of some of different vertical policy tools used to promote local content in Malaysia's petroleum sector

Policy vision	Key organizations	Legislation	Contracts and regulations	Programmes for capability building
Industrial Master Plans	Malaysia Petroleum Resources Corporation (MPRC)	Petroleum Development Act	Production Sharing Contracts (PSCs)	Supplier Development Programme
Masters plan for gas & petrochemicals				Specialized institutes and universities (e.g. UTP and INSTEP)
Economic transformation programme 2010 (ETP)	Petronas	Promotion of Investments Act, 1986	Petronas procurement requirements for Oil field services and Equipment.	Scholarships to study abroad
				Petronas touring 'Clinic' for local suppliers

¹²² Considerable transversal capabilities are embedded in the shipyard industry. In Norway, the reversed trend took place. There were pre-existing shipyards with idle capacity in the 1970s and 1980s, and some of these have restructured and entered the market to build offshore platforms and equipment for petrochemical plants (Nordas, 2003:40).

7.2.2.1 Institutional framework

The establishment of Petronas through the enactment of the Petroleum Development Act in 1974 was part of a nationalistic drive through which government policy was clearly aimed at using public enterprises to achieve national economic and social goals (Gale, 1981:1142). Amongst those national economic goals was the will to develop linkages around the hydrocarbon sector.

In the absence of a dedicated ministry for oil and gas, local-content-related institutional responsibilities are mainly divided between Petronas and the recently created Malaysia Petroleum Resources Corporation (MPRC).¹²³ Indeed, in addition to its commercial mission, Petronas also has regulatory functions and has been the main driver for the implementation of LCPs.¹²⁴ It has dedicated units that are responsible for local content-related initiatives (Pemandu, 2012; Tordo and Anouti, 2013).

7.2.2.2 Policy vision and planning

Local content policies to encourage the domestic procurement of goods and services in the petroleum sector have been set as part of the country's broader economic

¹²³ As part of the governmental actions to fulfill local content objectives, the ETP further suggested the creation of a government body to oversee linkage development arising out of the petroleum industry. Initially, what the programme called "The Oil Field Services Unit" was to be set up with the responsibility to make recommendations on how to make the domestic industry more competitive, ensure coordination between all existing, planned and potential clusters of 'Oil Field Services and Equipment' activity, and the Malaysian supplying industry to investors (ETP, 2010:184). It would appear that a year later, the government body that was effectively created with such mandate was the Malaysia Petroleum Resources Corporation (MPRC).

¹²⁴ The role of national companies in the regulation of extractive sectors is particularly complex and well researched. Governments have relied on NOCs to accomplish several objectives by granting them public prerogatives in terms of regulations, contract negotiations and licensing (e.g. Petrobras in Brazil, Pemex in Mexico Petronas in Malaysia, Sonatrach in Algeria, Kuwait Oil Company in Kuwait, Sonangol in Angola, etc) while in other countries (e.g. Norway), such role is assumed by a ministry of energy (see Heller and Marcel, 2012; Marcel, 2006; Lebdioui, 2017). Up until the 2010s, there was a widespread consensus in favour of the separation of functions up due to the potential conflicts of interests, excessive power, performance and coherence issues (Marcel, 2006; Sarbu, 2014; World Bank, 2007). However, the separation of functions also has limitations and has not achieved positive outcomes in several countries, which sheds light on the contextual determinants that influence the desirable role of the NOCs. For instance, NOCs might have accumulated strong technical and managerial capabilities but that newly create state agencies might not have (Heller and Marcel, 2012; Lebdioui, 2017).

development strategy, through the various Malaysia Plans, Industrial Master Plans, Master Plans for Gas and Petrochemicals and the Economic transformation programme.

Malaysia's Industrial Master Plans (IMP) in particular have provided the framework for the utilization of petroleum resources in key economic sectors. The IMP2 (1996-2005) emphasized the strengthening of linkages and the increase of value-added activities in the petroleum sector. The IMP3 (2006-2020) sought to achieve long-term global competitiveness and the integration of Malaysian companies into regional value chains. Upstream linkages in the petroleum sector are also prioritized in the Economic Transformation Programme (2010), which aims to enhance Malaysia's position as a regional hub for oil and gas services and equipment by 2017.¹²⁵

7.2.2.3 Legal and regulatory framework

7.2.2.3.1 Local content requirements and incentives

LCPs in Malaysia's petroleum sector mostly derive from the Petroleum Development Act of 1974 (PDA), the Companies Act 1965, the Promotion of Investments Act of 1986 and terms set in Production-Sharing Contracts (PSC) and licensing requirements of suppliers.

The PDA aimed to gain greater control over national petroleum resources, to provide affordable petroleum resources to the local market to form the basis for capital and energy-intensive industries, and to encourage local participation in both upstream and downstream activities (Nordas et al, 2003). The PDA also assigned the exclusive right of exploration and production of oil in Malaysia to Petronas. This right is mostly exercised through production-sharing contracts (PSCs) with international oil companies.

The two other main effective frameworks for local content requirements are licensing requirements of suppliers and production-sharing contracts (PSCs). As part of Petronas' procurement process, suppliers of oil field services and equipment (OFSE) must receive a license that can only be obtained by foreign suppliers if they partner with local firms. If

¹²⁵ The oil, gas and energy sector is the first of 12 'national key economic areas' and three of the targets for this sector relates to the development of upstream activities.

incorporated locally, foreign suppliers are restricted to a 30% equity stake (US Department of State, 2011).

PSCs must comply with the national objective of maximizing Malaysian participation in the petroleum operations, notably to minimise outflow of foreign exchange and develop “ancillary industries arising from petroleum operations to enhance the growth of the national economy.” (PSC, Art. 12.1). In that perspective, production sharing contractors are required to procure inputs locally if not locally available, unless approval is given by Petronas to source internationally (PSC, Art.12.2).¹²⁶ Contractors also need to submit a 5-year plan indicating how they will achieve the objectives of maximizing Malaysian participation in the use of local inputs required for petroleum operations.

According to the Malaysian law (PSC, Art. 26.1), the contractors are also required to minimize the employment of foreign workforce and to fill positions with adequate Malaysian personnel, while expatriates can be employed upon written approval by Petronas.¹²⁷ Petronas’ partners are also required to pay to Petronas an annual research contribution, the “Research Cess,” of 0,5% of the amount of cost oil plus their share of profit oil, in order to promote R&D (PSC, Arts 9.1 and 9.2).

Lastly, as a result of the Promotion of Investments Act of 1986, tax incentives are also provided to petroleum companies and suppliers if they contribute to the local economy through industrial linkages and knowledge transfer (PIA, Arts.5, 26).

7.2.2.3.2 Obstacles for local content enforcement

Malaysia’s recent international commitments constitute an obstacle to some of the local content policy tools used in the country. Malaysia has been a member of the World Trade Organization (WTO) since 1995 and must consequently abide by the Trade-Related Investment Measures (TRIMs), which can impact a country’s ability to impose certain

¹²⁶ The clauses referred to in this section belong to the 1998 model contract of PSCs.

¹²⁷ Petronas also requires its contractors to train Malay personnel for all positions, including those held by expatriate personnel in which local personnel is not competent as well as commit a minimum monetary amount to be allocated to the training of Petronas personnel (the amount being contract specific) (PSC, Arts. 26.1, 26.2).

local content requirements (CCSI, 2016b).¹²⁸ A separate WTO agreement, the General Agreement on Trade in Services (GATS) also bans several types of local content requirements. Nevertheless, GATS only applies to the sectors that a country chooses to include in its schedule of commitments. Malaysia has not included the petroleum sector in its schedule of commitments (ibid.). Hence, notwithstanding the limits WTO agreements do place on policy space, they also leave states some degree of flexibility to adopt local content measures.¹²⁹

As of September 2018, Malaysia had entered into 71 bilateral investment treaties (BITs) and 27 Treaties with Investment Provisions (TIPs). Such treaties can contain restrictions on local content requirements. However, aside from the inclusion of National Treatment Obligations and Most Favoured Nation clauses, which are included in most BITs, no BIT contained specific restrictions on performance requirements. Among the TIPs, the TPP signed in 2016 is particularly constraining for domestic local content policy (ibid).

7.2.2.4 State-led investments

One of Petronas' responsibilities implies the reinvestment of resource revenues, which partly explains Petronas' diversification, both vertically and horizontally. Petronas' investments have enabled the company to develop considerable capabilities in upstream activities. In fact, Prime Minister Mahathir responded the following when asked about the role of the petroleum industry:

“Most oil producing developing countries do not have the expertise nor capital to extract oil and have to invite international oil companies. Those countries then collect the

¹²⁸ TRIMS preclude requirements to purchase products of domestic origin, limitations on the amount of imported products that an enterprise may purchase or use; and restrictions on foreign exchange necessary to import goods and services.

¹²⁹ To the extent that there is no relevant GATS commitment, local content measures allowed under WTO agreements include: subsidies or other supports to domestic firms; requiring or incentivizing use of domestic service suppliers and labour; requiring joint ventures or a certain share of domestic equity; requiring or incentivizing transfers of technology; restricting exports in order to encourage development of downstream segments of the value chain; requiring or incentivizing R&D or other expenditures to be made in the host state; and requiring or incentivizing firms to locate their headquarters or particular activities in the host state, or to locate their investment in a particular area in the host state (CCSI, 2016b).

royalties. But in the case of Malaysia, we decided that we cannot be satisfied with only collecting royalties and we must have the capacity to exploit our own resources. We have to acquire the technology. The first phase was the collection of royalties and the use of that capital to invest in our capabilities. So unlike most other national oil companies who merely collect royalty, we wanted to get into the [upstream and downstream] industries because they have good returns. We got involved in the whole value chain, including exploration, production, processing, and chemical industries... from bringing up the oil and gas to marketing and selling it. We also needed a fleet of tankers [which is why Petronas entered the maritime services business]. PETRONAS is not just another royalty collector, but a major player in the oil and gas industry. It now gets awarded contracts in other countries like regular international oil companies” (Prime Minister Mahathir Mohamad, Personal Communication, 7 April 2017).

Interestingly, unlike Chile’s state-owned copper company Codelco, Petronas has indeed managed to export its upstream services across the world from 1990 onwards. In the beginning, Petronas encountered difficulties venturing outside the Asia-Pacific region, but it eventually succeeded and currently operates internationally in 32 countries.¹³⁰ As a result of this internationalization, Petronas has become the fourth largest non-financial TNC from a developing country in terms of size of foreign assets (UNCTAD, 2003).

One of the reasons put forward by managers at Petronas for its internationalization was the relatively small size of the domestic petroleum resources, meaning that internationalization is the only way to maintain long run productivity and profitability (Abd Rahim Mahmood, Head of Strategic Research at Petronas, Personal Communication, April 2017). While resource exhaustibility is one of the key considerations and potential obstacle for linkage development, Petronas has managed to expand its operations overseas in the face of depleting natural resources.

¹³⁰ As of 2005, Petronas had 101 wholly owned subsidiaries, of which 57 operated outside Malaysia (Petronas 2005). Petronas ranked 68th in the Fortune’s global 500 in 2005 (Fortune, 2018).

7.2.2.5 Capacity Building

7.2.2.5.1 Technical and Managerial Skills development

Despite its relatively good education system compared to other developing countries at the time, Malaysia initially faced skills shortage problems because of a lack of technical expertise in the petroleum sector (Lall, 2001). A major recruitment drive by Petronas in 1975 was unable to attract highly qualified and experienced personnel, while the company's staff (of about 40 full time employees at the time) was mostly made of junior civil servants and did not include any geologist (Gale, 1981).¹³¹ However, "Petronas realized its ignorance and made strenuous efforts to overcome it", notably through training programmes, by seeking assistance with foreign government petroleum agencies (particularly from Indonesia, France, Italy and Saudi Arabia to receive strategic help and scholarships to study petroleum engineering), and by establishing several technical training institutes from 1983 onwards (ibid:1141).

In 1983, Petronas established the Institut Teknologi Petroleum of Petronas (INSTEP), designed to offer programmes for petroleum engineers, technicians, and technical executives. In 1997, it established a specialized university, the Universiti Teknologi PETRONAS (UTP), which has produced over 10,000 graduates in engineering and technology-related academic programmes. Petronas also established its Leadership Centre in 1992, in order to develop the managerial skills of its employees, as well as an online e-learning platform, whose materials are also accessible to government agencies and the private sector (Tordo and Anouti, 2013).

Petronas also sponsored Malaysian students to pursue tertiary education in the country and overseas. Since 1975, through the Petronas Education Sponsorship Programme, Petronas has invested more than USD 850million in education sponsorship, technical training and capability building, enabling more than 36,500 students to pursue secondary

¹³¹ The lack of technical expertise in Malaysia was reflected in the condescending remark by an international oil company executive dismissing Malaysia's oil knowledge by stating that "Malaysians wouldn't know an olefine from a chocolate bar." (Gale, 1981:1141)

education and tertiary education at home and abroad, making Petronas one of the major education corporate sponsors in Malaysia (Petronas, 2017a).

7.2.2.5.2 Vendor Development Programme

The Petronas Vendor Development Programme (VDP) was set up in 1993 with the objective to develop a competitive Malay industrial base and local technologies in petroleum-related manufacturing. The VDP has helped 99 domestic companies become vendors, who collectively have been awarded contracts worth more than USD2billion (RM8.3 billion) (Petronas, 2013, Tay 2018).¹³²

Through the VDP, Petronas tests local technological solutions and ensures that vendors' products are used in the domestic market. Petronas invites potential vendors through tendering, or vendors may present their capability for consideration by Petronas, and need to comply with a set of minimum technical requirement.¹³³ Every year, the vendors are audited by Petronas to ensure they met the company's standards. Amongst the general requirements to become a Petronas vendor, the company must be locally incorporated and meet minimum Bumiputera requirement. After being appointed as a Petronas vendor, firms enjoy several benefits. They would receive more stable contracts due to the fact that their products and services would be technically accepted by all Petronas subsidiaries (domestically and abroad) and by petroleum companies operating in Malaysia, such as Shell and ExxonMobil. Vendors also benefit from the sharing of best practices by Petronas. For instance, Petronas has been holding a touring "clinic" which offers a platform for local suppliers to interact with Petronas staff and learn about company's procurement system, receive help in registering and accessing future opportunities, both domestically and abroad (Tordo and Anouti, 2013).

Managers from several firms have recognized that their integration in the Petronas VDP enabled their firm to develop further capabilities, increase their revenues, gain exposure

¹³² For instance, in 2013, three companies (Eastern Energy Services, OMNI Oil Technologies and Petroclamp) leveraged their engineering capabilities to get appointed as Petronas Vendors, which resulted in the local manufacturing of previously imported products.

¹³³ Companies also need to meet a Key Performance Index (KPI) set by Petronas. The KPI includes ISO:19001 standard, zero lost time injury and zero complaints from clients.

to international markets and expand internationally, as well as stabilize their contracts, which used to be on ad hoc basis, making it difficult to plan future expansion (The Edge, 2013). In some instances, the VDP has acted as a stepping-stone for Malaysian companies to compete globally. Examples of such firms include Bumi Wangsa (a local manufacturer of wellhead control panels), FM Plastics Industries (which supplies tubular tubing rolls and polyethylene bagging rolls), Proeight (a manufacturer of wellhead seals), the PBJV Group (which offers hook-up, commissioning, transportation and installation services), amongst many others firms.¹³⁴

The VDP has also helped domestic firms develop marketing capabilities, which is crucial in a context where local SMEs suffer from a marketing weakness in the development of their own brand names, similarly to the context of local suppliers in the copper sector in Chile (Tan, 2008; Sani et al, 2015).

Overall, there are thus strong reasons to argue that the VDP has been successful in enhancing the industrial capabilities of local suppliers in petroleum sector.

7.2.3 Overview of the accumulation of downstream capabilities

Malaysia pursued downstream value addition in the petroleum sector by accumulating capabilities related to oil refining, oil trading, lubricants production, and the production of petrochemicals that are used to manufacture plastic products and synthetic rubber.

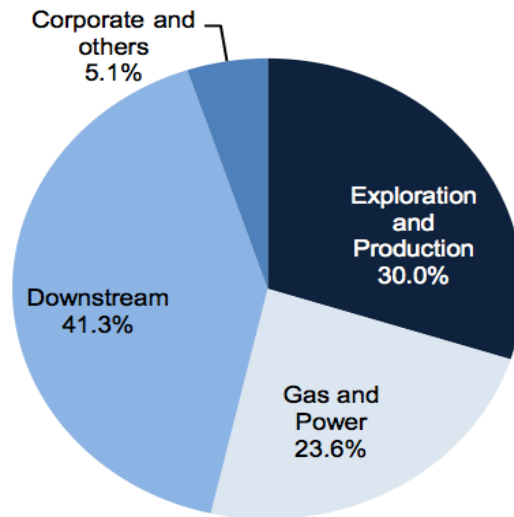
Petronas started to move towards downstream activities in 1983 when it set up its first small-scale refinery.¹³⁵ Petronas now has a total refining capacity of 500,000 barrels per day enabling the production of different petroleum products such as motor gasoline, diesel, lubricants, jet fuel, naphtha and residual fuel oil for the world market. Petronas subsequently retains some of the value generated in marketing and trading of crude oil

¹³⁴ Thanks to the VDP, despite a context characterized by a lack of trust for the local production of quality wellhead seals in comparison with trusted foreign expertise and brands, Proeight has gone global and opened its first office abroad in Latin America in 2014 (Alsagoff, 2015).

¹³⁵ In the 1990s, it had established joint ventures with global players such as Conoco and Statoil to build more complex and larger refineries (Nordas, 2003).

and petroleum products through its subsidiary, Petronas Trading Corporation Sendirian Berhad. As figure 26 shows, the largest share of Petronas' revenues came from downstream activities in 2012.

Figure 26: Share of Petronas' revenues by area of activity in 2012



Source: World Bank (2013)

7.2.3.1 Beneficiation towards other industries (petrochemicals, plastics and rubber)

Policy-makers in Malaysia have viewed the oil and gas sector as a catalyst for industrialization in many respects, as reflected by the following statement: “Gas can be used as feedstock in many industries, including in petrochemicals and the plastics industry, which is a big industry in itself. Today, plastics are even used in building airplanes, so there is no end to the industries that originates from oil and gas production.” (Prime Minister Mahathir, Personal Communication, 7 April 2017). The domestic gas resources have indeed also served as feedstock for the domestic petrochemical industry (ammonia and ethylene based petrochemical plants), as well as for power generation in industries and households (through the production of methane, ethane, propane and butane) (Mahmood 2013).

Malaysia went from being an importer of petrochemicals to becoming an exporter of major petrochemical products. Petrochemicals are the second largest contributor to Malaysia's manufactured exports (MITI, 2017). The plastics industry has also become

one of the most dynamic industries in Malaysia's manufacturing sector and has been rated as one of the most competitive in Asia.¹³⁶ Table 10 shows that plastic production is the largest subsector in terms of employment, with around 80,000 employees. In 2016, it generated USD3.30 billion of exports (Malaysian Petrochemicals Association, 2016).

Table 10: Selected Indicators of the Malaysian Petrochemical industry in 2014.

Subsectors of the Petrochemical industry	Sales (USD Billion)	Export (USD billion)	Employment
Overall	69.5	37.2	121,703
Chemical products	12.0		26,260
Petroleum products	51.6		13,503
Plastic products	5.9		81,962

Source: MITI (2017a)

Malaysia's growing petrochemical (and plastics) industry also supports other major sectors of the domestic economy by providing a steady supply of feedstock material to automotive, electronics and synthetic rubber production.¹³⁷

7.2.4 Policy tools to Build Local Capabilities in the Downstream Sector

Successful downstream value addition in Malaysia's petroleum industry relied on the availability of feedstock, good infrastructure and its strategic location in the ASEAN market, but also relied on strategic policies adopted by the government. Alongside state-led investments, several policies, including fiscal incentives and skills development programs, contributed to the successful value addition of Malaysia's petroleum resources.

7.2.4.1 Fiscal incentives

In order to further encourage local refining of crude oil, an export tax on crude oil of 25% was introduced in 1993 (before being reduced to 20%) (Malaysian Government, 1995;

¹³⁶ In 2016, the plastic sector was composed of about 1,300 plastic companies producing goods ranging from common household items and packaging materials to parts and components for the E&E and automotive industries (Malaysian Petrochemicals Association, 2016; MIDA, 2018a).

¹³⁷ The increasing need for synthetic rubber as a replacement to natural rubber required the development of a large-scale domestic petrochemical industry (Malaysian Petrochemicals Association, 2018). Petrochemical products, as well as styrenic plastics are also used in the manufacture of consumer products such as tyres and electronics (Ananthalakshmi, 2017).

Nordas et al., 2003). In addition, petrochemical production has been on the list of eligible activities for consideration of pioneer status and investment tax allowance under the Promotion of Investment Act of 1986, alongside twenty other activities.

7.2.4.2 Skills Development

The petrochemical industry is a highly technology- and knowledge- intensive industry, which requires highly trained and skilled workers (MITI, 2017). The Institut Teknologi Petroleum of Petronas (INSTEP) and the Universiti Teknologi Petronas (UTP) have offered graduate courses in refinery and petrochemical processes, as well as advanced chemical process design. Petronas funds this university and hires most of its graduates. Value addition in Malaysia's petroleum sector has consequently leveraged the specialized human capital accumulated through Petronas' investments in education and training.

7.2.4.3 State-led investment promotion

Petronas also played an instrumental role in developing the petrochemical industry by establishing the Petronas Chemicals Group Berhad (PCG) in the 1980s, after deciding to pursue more high value-added activities following depressed crude oil and gas prices of the 1980s and 1990s (World Bank, 2013). Today, PCG has become one of the leading petrochemicals producers in Southeast Asia. It is the largest producer of methanol in South East Asia, and the fourth largest in the world (Petronas Chemicals Group, 2017).

The Malaysian Government has also encouraged the growth of downstream industries by successfully attracting several MNCS to develop petrochemical facilities in collaboration with Petronas.¹³⁸ The Malaysian government and Petronas were successful in recently developing three major petrochemical clusters involving international and local companies operating throughout the entire petroleum value chain.¹³⁹

¹³⁸ The Malaysian government managed to attract major industry players such as Shell, ExxonMobil and Dow Chemical, amongst others (MIDA, 2016).

¹³⁹ The most diversified of the petrochemical clusters is in Kertih and hosts the Pengerang Integrated Petrochemical Complex (PIPC), which totaled USD27 billion in investments and includes two ports (Tordo and Anouti, 2013). Downstream petroleum activities have in fact enabled the creation of industrial clusters in previously underdeveloped regions of Malaysia, with

7.2.4.4 Challenges for downstream value addition

One of the main challenges for the Malaysian petrochemical industry remains the volatility of crude oil prices that create uncertainty for upstream and downstream investments. The petrochemical industry is indeed characterized by a cyclical nature and needs to overcome short-term and sporadic volatilities in feedstock costs (Federation of Malaysian Manufacturers, 2018).

In addition, while Malaysia continues to benefit from its strategic location in the ASEAN market and from China's large imports of petrochemicals, another challenge lies in the 'threat' posed by China's rapid industrial expansion leading to tougher competition in global and regional markets. The Federation of Malaysian Manufacturers (2018) anticipates that Malaysian petrochemical companies will face increasing competition in ASEAN markets, as these countries are also progressively developing their own petrochemical industries.

Another source of potential competition could come from the shale gas revolution, which has resulted in a robust petrochemical capacity expansion in the United States (Thayoob, 2018). Malaysia will thus need to further enhance the competitiveness of its petrochemicals production in order to face higher competition in the foreseeable future.

considerable externalities for local populations and firms because of complementary investments in 'shared' infrastructure (e.g. roads, ports and electricity supply) (Nordas et al., 2003).

7.3 PALM OIL ¹⁴⁰

7.3.1 Overview

The emergence of a palm oil refining industry has been a key achievement in Malaysia resource-based industrialization. Malaysia transitioned from being a minor crude palm oil producer to becoming a major exporter of processed palm oil. With annual export earnings from palm oil products increasing from USD15 million in 1960 to USD27 billion in 2011, the palm oil industry has become the second largest contributor to external trade, and the fourth-largest contributor to gross national income (with about 8% of GNI per capita in 2011). The industry also generates direct employment for around 570,000 people and an estimated total employment of 860,000 people (Azhar, 2009). Despite the fact that palm oil processing in Malaysia initially lacked comparative advantage and faced various market barriers, the policies implemented by the government since the 1970s have been key in developing competitive palm oil-based industries.

7.3.1.1 Overview of forward linkages: success and limitations

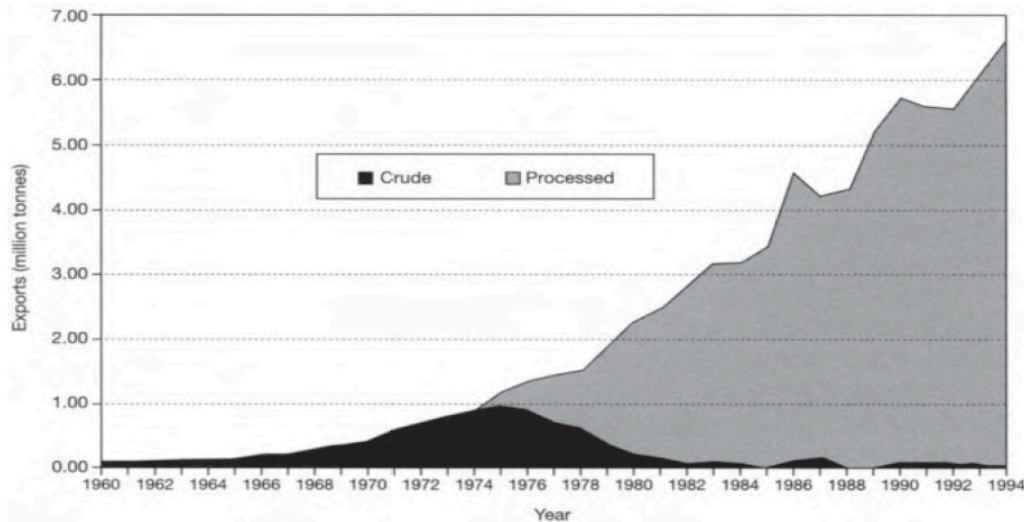
As shown by figure 27, the share of processed palm oil exports in total palm oil product exports increased rapidly from 0% in 1974 to 99% by 1994.¹⁴¹¹⁴² With an annual growth rate of 34% in the 1970s and 1980s, palm oil processing grew much faster than manufacturing sectors and other resource-based industries, which respectively grew at about 12% and 8% per annum in the same period (Gopal, 2001). For additional comparison, palm oil processing in Europe and the world grew at a respective compounded rate of only 2% and 11 % per annum in the same time period (ibid.).

¹⁴⁰ The analysis of the development of the palm oil industry in this section extensively relies on the comprehensive works by Gopal (1999, 2001).

¹⁴¹ Refining capacity has indeed increased from less than 40,000 tons in the early 1970s to 25 million tons in 2012 (Fold and Whitfield, 2012; Gopal, 1999, 2001).

¹⁴² However, such trend began to reverse after 2000. See Appendix E for the evolution of the share of processed palm oil in Malaysia's palm oil exports after 1994.

Figure 27: Malaysia's palm oil exports between 1960 and 1994

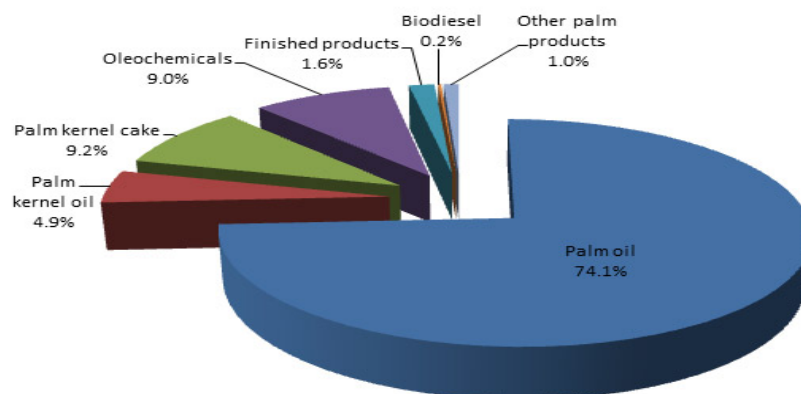


Source: Gopal (2001)

The establishment of refineries has relied on increased productivity (Bruno, 2017). Private returns on palm oil processing and export were more than 30% per annum in the late 1970s, enabling Malaysian palm oil refiners to compete internationally with about 30% of the gross margins of their European counterparts and less than 75% of world gross margins (Gopal, 2001).

Beyond refining, a further layer of value addition (albeit relatively modest) has taken place in Malaysia's palm oil sector. As shown by figure 28, value added palm oil-based products represented about 25% of total palm oil exports in 2011.

Figure 28: Breakdown of palm oil products exported in 2011



Source: May (2012)

Despite the high growth of palm-based products, it can be argued that the depth of forward linkages has been relatively weak, given that most of downstream value addition is limited to basic refining, while oleochemicals and biodiesel only respectively constitute 9% and 0.2% of palm oil exports. In addition, Malaysia concentrates almost exclusively on simple oleochemicals, namely fatty acids and fatty alcohols, which accounted for 99% of overall oleochemical output in 2011 (World Bank, 2013). To achieve higher value-addition, Malaysia would need to progress towards the production of more complex oleochemical derivatives, such as surfactants, bio lubricants and agrochemicals (ibid.)

Malaysia can further add value to its palm oil sector through the production of biofuels, which could meet the renewable energy demand in the EU and US markets (Loh and Choo, 2013; Nambiappan et al, 2018). However, it appears that several challenges have hindered bio-diesel production. Firstly, the fluctuations of crude palm oil prices have led to a market risks and decreased competitiveness compared to conventional fuel (Loh and Choo, 2013; Lim and Teong, 2010). Secondly, governmental efforts in developing palm oil-based biodiesel have been too modest (Jomo Sundaram, personal communication, March 2017). Nevertheless, an alternative view sustains that the Malaysian Palm Oil Board has been carrying out extensive R&D in palm biodiesel since the 1980s (Subramaniam et al., 2010; Augustin, 2017).¹⁴³

Perhaps it is too soon to assess whether Malaysia's efforts in R&D in palm oil are bearing fruits, but what can be said with certainty is that the commercial application of the research has not yet reached scales needed to become significant in the country's export basket. In addition, a considerable degree of uncertainty stems from the recent proposition in January 2018 by the EU to phase out palm oil from biofuels mix by 2021 and cap crop-based biofuels at the member states' 2017 consumption levels and at 7% of all transport fuels until 2030 (European Parliament, 2018).

¹⁴³ Such view emphasizes the rising number of patents, academic publications, the establishment of a biodiesel pilot plant in 1985, the implementation of the B5 (95% petroleum diesel and 5% palm biodiesel) in 2011 and B7 (93% petroleum diesel and 7% palm biodiesel) programmes in 2015 (Augustin, 2017). The Malaysian government also launched the National Biofuel Policy in March 2006 (MPOB, 2010; MPIC, 2006; Wahid, Weng and Masri, 2007) and the Malaysian Biofuel Industry Act in 2007 (Malaysian Biofuel Industry Act, 2007; Johari et al., 2015).

7.3.1.2 Overview of Backward linkages

The demand for inputs and services required in palm oil processing (such as chemicals and engineering supplies) has become increasingly met by local industries. The progressive localization of backward linkages was the result of the accumulation of experience, technology, knowledge and engineering skills in palm oil processing techniques, as well as the high level of vertical disintegration in refining and fractionation technology, which enabled the local fabrication of less sophisticated equipment and components (Gopal, 1999:382).

Initially, in the 1970s, refining and fractionation technologies and equipment were mostly imported, while local capital expenditures were mainly for civil and structural works, fabrication of simple vessels, tanks and piping (ibid.). Nowadays, local skills have reached a level where local providers of goods and services in palm oil processing have exported their expertise to other countries establishing local oils and fats processing facilities (ibid.).^{144 145}

7.3.2 Historical evolution: emergence, ownership and value addition

Several phases of development can be distinguished. The first phase was the establishment of the palm oil industry as a way to diversify away from dependence on volatile rubber prices. The second phase was the development of palm oil refining capacity from the 1970s. The third one was the development of further downstream activities from the 1990s onwards.

Palm oil was initially introduced to Malaya in 1875 by the British as an ornamental plant.¹⁴⁶ The reason for the rapid development of oil palm cultivation in the 1960s was to

¹⁴⁴ For instance, Oiltek is a Malaysian edible oil processing and engineering firm created in 1980 and that has undertaken several projects overseas.

¹⁴⁵ By the late 1980s, foreign capital expenditures were limited to sophisticated and precision plant equipment such as separators, high pressure presses, chillers, filters, membranes, motors, engines, control devices, instrumentation, laboratory equipment and analytical instruments (ibid.)

¹⁴⁶ Malaya was the term used to refer to territories that form modern-day Malaysia and Singapore under the British Colonial Rule before it gained independence within in 1957.

reduce the dependence on natural rubber, which was facing cyclic price declines as a result of technical developments in synthetic rubber. The Malaysian government recognized the pressing need for agricultural diversification and considered oil palm to be a profitable alternative crop to rubber (Gopal, 2001; Goldthorpe, 2015). Palm oil products have later gradually replaced rubber as the most important exported soft commodity.

The government policy for palm oil development (as well as rubber) consisted in the introduction of land development schemes, which were also seen as a mean to eradicate poverty as they allowed plantation developed land to be distributed to the landless poor (NST, 2017).¹⁴⁷ Between 1960 and 1990, FELDA alone accounted for 33% of the newly planted oil palm areas (Gopal, 2001:126). In 1966, five year after the beginning of FELDA's palm oil programme, Malaysia overtook Nigeria as world's largest exporter of palm oil. In the 1980s, government policy also included the 'Malaysianisation' of three plantation companies, namely Guthrie, Golden Hope and Sime Darby. The Malaysian State has also invested in the palm oil sector (and in Sime Darby in particular) through the Permodalan Nasional Berhad (PNB), Malaysia's biggest fund management company and investment instrument of the government since 1978. By 1995, Malaysia accounted for 52% of the world palm oil production. In 2017, its share dropped to about 30% of annual world palm oil production (Ministry of Plantation Industries and Commodities-MPIC, 2018). Sime Darby and FELDA have become the world's largest plantation companies, based on planted area (Azhar, 2009).

Interestingly, when palm oil plantations were foreign owned, there was no interest in value addition. As noted by Gopal (2001:239), prior to 1974, there were few attempts to undertake refining and fractionation of palm oil for the export market. The largely European-controlled plantation companies preferred to export crude palm oil while multinational companies did not see many gains in relocating their vegetable oil

¹⁴⁷ These programmes successfully combined both commercial and social objectives. After less-successful state-level resettlement initiatives in the 1950s and 1960s that did not follow commercial principles, FELDA and FELCRA were created to resettle rural families in schemes in which smallholders contribute their land and labor and receive dividends while the management and marketing operations was carried out by FELDA, enabling economies of scale (World Bank, 2013). More than 500,000 people have benefitted from the FELDA scheme (ibid.) Management expertise from the government was used to run the organised smallholdings (Azhar, 2009).

processing facilities in Malaysia. As part of the NEP, which was incorporated in the Second Malaysia Plan (covering the years 1971-1975), the government undertook the nationalization (or more accurately, the hostile takeover in the London Stock Exchange) of foreign-owned plantations in 1981. The desire to process palm oil then increased when the industry became domestically owned.

According to Gopal (1999, 2001), at a seminar organized in Kuala Lumpur in 1978 by the International Trade Centre (ITC), several analyses considered the processing and refining of crude palm oil in Malaysia as having limited potential and viability. One of the reasons invoked was the lack of experience of Malaysian refiners in sourcing, processing, blending, manufacturing and marketing process palm oil products, in comparison to refiners in industrialized countries. Another reason was that the transportation, handling and shipping facilities and procedures in Malaysia were designed for the bulk movement of crude palm oil instead of processed palm oil. Long transportation between Malaysia and consumer markets such as the European Union was also believed to lead to quality deterioration and reduced interaction between suppliers and purchasers (Gopal, 2001). Western Europe's high import duties on processed palm oil products also discouraged the import of processed palm oil products. These arguments consequently sustained that the palm oil refining industry in Malaysia was facing too many major barriers to become competitive and export-oriented (ibid.). Most of these arguments derive from a static understanding of the process of capabilities accumulation.

In the late 1970s, against the advice of international institutions, the Malaysian government began to encourage a shift from crude palm oil exports to refined products through taxation and incentive policies (Azhar, 2009). Similarly to the petroleum sector, the decline in commodity prices in the mid-1980s contribute to incentivize government-linked companies (GLCs) in the palm oil sector to invest in building downstream industries in order to capture more value added opportunities (World Bank, 2013).

7.3.3 Role of industrial policies

Value addition activities alongside the palm oil value chain have benefited from considerable government interventions. Government policies involved a mix of fiscal

incentives, investments in R&D, skills development and trade promotion efforts. It can be noted that most policies were geared towards an import substitution strategy until a shift towards export-orientation from the late 1970s onwards.

7.3.3.1 Overview of the industrial strategy

The palm oil industry was identified as a priority sector in each of the three industrial master plans (IMPs) since 1985 as well as the Economic Transformation Programme in 2010. The IMP1 (1985-1995) suggested addressing skills shortages through on the job training and outlined the role of the Palm Oil Research Institute of Malaysia (PORIM) to conduct R&D for palm oil processing. It also contained provisions for tax incentives, including a double deduction tax benefit on export sales and export tax on crude palm oil (CPO). By the end of the IMP1, Malaysia's processing capacity exceeded the supply of CPO. The IMP2 consequently emphasized the expansion of oil palm hectarage and encouraged the private sector to seek raw materials from abroad (Gopal, 2001).

The IMP2 (1996-2005), aimed to strengthen production linkages and increase value-added activities and productivity in the palm oil sector (Rasiah and Shahrin, 2006; MITI, 2006). The IMP2 put special emphasis on downstream processing through mechanization and R&D in biotechnology (such as mass tissue culture and cloning).

The IMP3 (2006-2020) emphasized downstream manufacturing activities into a wider range of higher value-added products. This objective would be achieved through enhanced R&D and closer collaboration between government research agencies and operators in the oil palm sector. The creation of various institutions since the 1980s, such as the Malaysian Palm Oil Council, enabled a smoother dialogue and flow of information between the government and industrial associations in the sector, such as the Malaysia Palm oil association (MPOA), the Palm Oil Refiners Association Malaysia (PORAM) and the Malaysia Oil Scientists and Technologists Association (MOSTA) (Gopal, 2001).

7.3.3.2 Fiscal incentives

The government of Malaysia recognized that policy incentives were necessary to promote secondary processing of the country's primary resources, and consequently implemented

a range of fiscal incentives since 1968 to encourage value addition and the export-orientation of the palm oil sector. In the past five decades, fiscal incentives for palm oil refining have included:

- Preferential export duties between crude palm oil and processed palm oil to encourage exports of processed palm oil products¹⁴⁸
- Tax credits focused on stimulating further downstream processing
- Replanting subsidies timed with peaks in crude oil prices
- Pioneer Status (with income tax exemption of 70% of statutory income for five years)
- Investment Tax Allowance (of 60% on the additional qualifying capital expenditure incurred within a period of five years).
- Export credit-refinancing scheme for pre- and post-shipment of exports.
- 40% abatement of corporate income for two years
- Seven years tax holidays for pioneer status refineries
- Tax exemptions for the utilisation of oil palm biomass.¹⁴⁹

Several of those tax incentives (such as the export duty exemptions on exports of higher value-added processed palm oil products) were specific to the palm oil sector. Others were part of a broader strategy targeting resource-based industrialization more generally (in particular the rubber, palm oil, timber and petroleum sectors). The remaining incentives (such as the export credit-refinancing scheme for pre- and post-shipment of exports) were applied to all priority sectors.

7.3.3.3 R&D and skills development

In the late 1960s, R&D in oil palm breeding began to expand after the Malaysian Department of Agriculture established the Oil Palm Genetics Laboratory through an

¹⁴⁸ This export duty, which escalated with the degree of processing of palm oil, appears to have been the most important policy instrument used to promote the growth of an export-oriented palm oil refining industry in Malaysia. It involved “a complex system of ‘transfer pricing’ to increase the margins for CPO processing and PPO export, at the expense of, but without being a burden to CPO producers, and without any government subsidy” (Gopal, 2001:305).

¹⁴⁹ Companies that utilise oil palm biomass to produce value-added products are eligible for Pioneer Status with income tax exemption and Investment Tax Allowances (MIDA, 2017).

exchange programme with West African economies and four private plantations (Donough and Chia, 2005; Rasiah and Shahrin, 2006). Later, in 1979, the Palm Oil Research Institute (PORIM) and the Palm Oil Registration and Licensing Authority (PORLA) were established but merged in 2000 as the Malaysian Palm Oil Board (MPOB). PORIM had been responsible for research on all palm oil-related activities.¹⁵⁰

R&D was also undertaken in collaboration with local universities through government grants.¹⁵¹ The government notably set aside RM1 billion under the Intensification of Research in Priority Areas (IRPA) programme, as part of the 6th and 7th Malaysia Plan, for R&D carried out in the Malaysian Agricultural Research and Development Institute (MARDI), PORIM and different universities, (Malaysia 1996, 2001; Rasiah and Sharin, 2006). Overall, the palm oil-related R&D support from the government enabled firms to both increase value added in existing products, and introduce new products in markets, such as biodiesel, specialty fats and vitamin A (ibid.). The state also set up Kolej Serdang, an agriculture-focused institution that has trained agro-industrial engineers and agro-business graduate (ibid).¹⁵²

7.3.3.4 Trade promotion

The marketing efforts overseas by the Malaysian government to promote palm oil-based products have been considerable. For instance, the Malaysian Palm Oil Council (MPOC) was established in the 1980s to counter the US soybean lobby against palm oil and to develop a comprehensive promotional strategy to position Malaysia as an international leader in the palm oil and fats market (Gopal, 2001).¹⁵³ PORIM and PORLA have also

¹⁵⁰ It started by conducting research on chemistry, quality, analytical techniques, transportation and handling of palm oil products, and later expanded towards R&D in oleochemicals and processed palm kernel oil, following the IMPs' recommendations (Azhar, 2009).

¹⁵¹ Research calls under the three IMPs had focused on different areas according to the needs and stages of the industries (For instance, the research focus under the IMP2 was mass tissue culture, cloning and genetic engineering to improve planting material quality).

¹⁵² Kolej Serdang became the Universiti Pertanian Malaysia (UPM) in the 1970s and was renamed 'Universiti Putra Malaysia' in 1997.

¹⁵³ "In the United States, the dominant view was that Malaysian palm oil had negative health effects. Now the emphasis has shifted towards the detrimental environmental consequences of palm oil production. There is some truth to this view but it is funded by existing vegetable oil

assisted the government for the market promotion of processed palm oil products.

Malaysia's attempts to export processed palm oil in the 1970s were blocked by the European common market, which practiced tariff escalation to make sure that refining capacity would remain in Europe. In order to counter the EU import duty structure, the Malaysian government had initially decided to introduce an export duty on crude palm oil production, as mentioned in section 7.3.3.2. Nevertheless, the EEC had subsequently increased its tariffs: "The effective protection in the EEC increased from about 100% in the 1970s to more than 200% in the 1990s" (Gopal, 2001). Such escalation in tariffs was the most important barrier to palm oil refining in Malaysia because the EEC was a major market that imported more than 30% of Malaysian crude palm oil exports and processed about 50% of world palm oil consumed in the early to mid-1970s (*ibid.*).

As underlined by Professor Jomo Sundaram, "the Malaysian government realized they could not beat the Europeans at their game and had decided to overcome this problem by focusing on alternative markets for palm oil" (Personal Communication, March 2017). Since the early 1990s, most of market deals for Malaysian processed palm oil have consequently been signed through government-to-government partnerships under so-called barter arrangements.¹⁵⁴ The barter trade under Malaysia's palm oil credit and payment arrangement (POCPA) involved the exchange of processed palm oil for finished goods, such as jet fighters, railway infrastructure, or commodities (The Star, 2009).¹⁵⁵

As a result of this barter trade, palm oil refining activities in Malaysia considerably increased and became the most competitive internationally within ten years, thanks to

lobbies" (Jomo, personal communication, March 2017). It is worth noting that some of the environmental consequences of palm oil production (such as considerable river pollution) have been overcome with the strict implementation of the environmental protection act.

¹⁵⁴ System of trade in which participants in a transaction directly exchange goods or services for other goods and services of equivalent value without the use of money.

¹⁵⁵ Of the RM1.8bil allocated by the government, the credit utilised up to 2009 was about RM900mil (USD245mil) (The Star, 2009). Around 22 countries have received POCPA credit, including North Korea, Algeria, Pakistan, Iran, Iraq, Cuba and Bosnia-Herzegovina (*ibid.*)

both economies of scale and scope.¹⁵⁶ As concluded by Nambiappan and Norfadilah (2002), merely depending on the conventional mode of doing business would not have been adequate to expand the export market for palm oil products. Counter-trade, or barter trade, thus appeared to be an innovative and mutually beneficial method of trading, especially when dealing with countries facing foreign exchange difficulties (ibid.).

Interestingly, it appears that most governmental efforts in trade promotion were a reaction to market barriers to Malaysian palm oil-based products abroad. It thus sustains the idea that free markets are not free, and evidences the important role of government intervention to promote exports in foreign markets.

7.3.4 Conclusion

As a consequence of the carefully crafted policy incentives, palm oil processing in Malaysia became highly profitable and competitive since the 1970s. Although higher levels of value addition can still be pursued through downstream diversification, it is clear that the Malaysian government, through fiscal incentives, R&D and trade promotion, provided an environment that conditioned the development of the domestic palm oil refining industry. Section 7.3 thus confirms the argument that the Malaysian palm oil refining industry would not have been able to compete in the world markets without such government interventions and the outstanding growth was neither due to the lack of barriers to, nor any significant advantages for, the location of CPO processing in Malaysia (see Gopal, 2001).

¹⁵⁶ The concept of economies of scope, developed by Chandler (1990), refers to the degree of specialization. In the case of Palm oil, Malaysia had specialized in one type of oil (palm oil), while Europeans had no scope nor scale as they were processing different types of oils, according to the season” (Jomo, personal communication, March 2017).

7.4 RUBBER-BASED MANUFACTURING

7.4.1 *Overview*

The Malaysia rubber industry has evolved from raw rubber exports to an –almost- fully integrated industry dominated by rubber-based manufacturing activities. Malaysia has become not only the world’s fourth largest producer of natural rubber but also the world’s leading exporter of rubber-based products such as latex products. The value of exports of rubber-based manufactured goods in downstream industries has exceeded twice the value of raw rubber exports since 2012. In 2017, Malaysia’s exports of rubber products reached RM21.6 billion (81.6% of which came from latex goods), while the total exports of the rubber sector (natural rubber and rubber-based products) reached RM32.3billion (MREPC, 2018). The rubber sector accounted for 3.5% of Malaysia total exports and 3% of Malaysia's manufacturing exports in 2017.

Rubber-based manufacturing in Malaysia can be categorised into three sub-sectors: latex products, tyres and tyre-related products, and industrial and general rubber products.¹⁵⁷ The Malaysian rubber-based sector is mostly oriented towards the healthcare sector, through the production of rubber gloves, prophylactics, disposable hospital kits, etc.

The World Bank (2013) argued that the success of the Malaysian rubber industry evidences the role that sector-blind policies play in economic diversification. Nevertheless, this section shows that several policies that contributed to promote rubber-based manufacturing were sector specific. Indeed, the sustained growth of the rubber-based industry can be attributed to role of several specialized government agencies (such as the Malaysian Rubber Board and the Malaysian Rubber Export Promotion Council) that undertook R&D, ensured quality control to promote sales in foreign markets, and incentivized value added through tax incentives.

¹⁵⁷ The latex products sub-sector is the largest sub-sector both in terms of sales and employment. In fact, the latex products subsector constituted 80% of the total natural rubber consumption in Malaysia in 2015 (Malaysian Rubber Board, 2016).

7.4.2 *Historical evolution*¹⁵⁸

Rubber trees were first introduced by British Colonists to the Malay peninsula in 1877. During the 1950s, Malaya produced half of the world's rubber. Rubber estates occupied about 65% of the entire cultivated area of peninsular Malaysia and rubber provided around 60% of export earnings (Goldthorpe, 2015).

During the 1960s and 1970s, policy makers and firms in Malaysia showed a lack of interest towards the rubber sector, following the idea that palm oil would become a more valuable commodity. A large number of rubber estates had been reconverted for palm oil plantations, because policy makers, following the World Bank's advice, wanted to decrease dependence on rubber (ibid., 2015). Nevertheless, the role of the rubber sector for the Malaysia economy had been reassessed from the late 1980s onwards with the three Industrial Master Plans and the ETP, which aims to double the contribution of the rubber industry in gross national income.

7.4.2.1 *Forward Linkage development*

As early as the 1930s, there is evidence of exports of low value-added rubber-based manufactured goods (such as production rubber shoes, slippers, hoses, bicycle tyres, conveyor belt and inner tubes) from Malaya, which involved labour-intensive activities but little capital equipment (Rasiah, 1995; Goldthorpe, 2015). At the time, the World Bank did not consider that Malaysia could become a major producer of rubber products and concluded that the most economically efficient location of rubber manufacturing industries is in the major centres of consumption because of the low cost of shipping rubber relatively to its market prices (Goldthorpe, 2015:66).

In the 1960s, the British manufacturer Dunlop established a tyre factory in Malaysia that was mostly oriented towards domestic sales. It benefited from tariff protection on tyres imports. In 1970, the government entered a joint venture with the multinational company Goodyear Tire and Rubber Company to manufacture automobile tyres, thus breaking the monopoly of Dunlop (Saham, 1980; Goldthorpe, 2015). The number of firms

¹⁵⁸ This section extensively draws on Goldthorpe's (2015) contribution to the topic.

manufacturing rubber goods rose from 50 firms in 1970 and 349 firms in 2012 while the number of workers they employed increased from 8000 in 1970 to 60,000 people in 2012, accounting for 6% of employment in the national manufacturing sector (Sawal, 2001; Goldthorpe, 2015; MIDA, 2008).¹⁵⁹

Until the mid 1980s, Malaysia still exported most of the natural rubber it produced as raw material. Since then, the rubber industry has further become vertically integrated through the development of an export oriented rubber-manufacturing sector that produces a wide range of goods for various sectors, including the automobile industry, transport equipment industry, footwear producers, the construction industry, and the electrical and electronics sector (UNIDO, 1991:75).¹⁶⁰ Nowadays, around 80% of the country's rubber manufacturing companies are Malaysian-owned, while FDI is concentrated in the production of industrial components and tyres (Goldthorpe, 2015). There are several Malaysian firms that became world-leading companies in the rubber-based manufacturing sector, such as Karex Industries, the world's largest condom manufacturer and Top Glove, the world's leading producer of latex gloves.¹⁶¹

Similarly to the palm oil and petroleum sectors, lower prices of natural rubber incentivized the use of rubber as a cheap feedstock for industry (World Bank, 2013). Indeed, most Malaysian firms manufacturing rubber-based products have responded to price signals by moving away from scale production towards higher value-added products, such as nitrile gloves for the healthcare industry prophylactics (ibid.)

7.4.2.2 Backward Linkage development

Malaysia has also managed to localize some of the backward linkages arising out of rubber production (both natural and synthetic). In the late 1960s, the local expenditures for equipment used in rubber plantations represented 64% of total expenditure, due to the

¹⁵⁹ For most of the 20th century, rubber plantation was the largest employer of labour in Malaysia.

¹⁶⁰ Most of the domestic natural rubber production has consequently been consumed by the domestic rubber-manufacturing sector while rubber imports increased from 31,000 metric tons in 1985 to more than 1 million metric ton in 2013 (Malaysian Rubber Board, 2016).

¹⁶¹ TopGlove started as a family-owned rubber trading company and shifted towards contraceptives production to enter more lucrative activities in the rubber value chain (Liau, 2012).

local supply of building works, bulking and coagulating tanks, size reduction equipment, cast-iron rollers and minor items such as tapping knives and containers to carry liquid latex (Thoburn, 1973, 1977; Goldthorpe, 2015). Nowadays, several Malaysian firms are involved in the design, fabrication and installation of rubber plants overseas.

Before the 2000s, Malaysia did not manufacture any synthetic rubber and most of its domestic industrial demand was met through consumption of natural rubber. Nevertheless, from the 2000s onwards, several firms have set up facilities in Malaysia to manufacture nitrile latex to supply the local glove and tyres producers (Goldthorpe, 2015).^{162 163} Those investments are in line with the IMP3's recommendation to establish facilities to manufacture ethylene propylene rubber and ethylene propyleniendiene rubber. Although Malaysia's synthetic rubber exports increased by 49.7% between 2015 and 2016, Malaysia is still a net synthetic rubber importer (MREPC, 2018). Interestingly, 80% of Malaysian firms use locally produced synthetic rubber while 75% of manufacturers with foreign involvement purchase over 50% of their synthetic rubber from abroad. There is thus a large difference in purchasing behaviour between domestic and foreign firms (Goldthorpe, 2015:105). This trend is similar for forward linkages: Foreign firms have fewer links with other manufacturers in Malaysian economy (ibid.).

However, it appears that the supply of factor machinery and equipment required in rubber-based manufacturing activities have generally not been met locally, except for the local manufacture of machinery to produce latex goods (UNIDO, 1991:103).¹⁶⁴

¹⁶² Those firms include Petronas, MNEs such as Synthomer, and the Malaysian Synthetic Rubber Company, established in 2013 as a joint venture between Japanese and South Korean firms.

¹⁶³ Synthetic rubber is mostly composed of polymers that derive from petroleum byproducts, which have been supplied by Malaysian refineries in recent years.

¹⁶⁴ Rubber-based manufacturing companies import over 75% of their factor machinery and equipment (Goldthorpe, 2015:78). For instance, tyre fabrication machinery as well as moulding equipment are mostly imported from Japan, the USA and the EU (Sawal, 2001)

7.4.3 Industrial Policies to promote rubber-based manufacturing

The vertical promotion of rubber-based manufacturing in Malaysia included financing for R&D in rubber-related areas, FDI promotion to gain access to foreign technology and export markets (through distribution channels), quality testing for different export markets, and tax incentives for investment in the sector. Such policies have been fruitful: between 1970 and 1985, the output value of the rubber sector increasing fivefold, and exports grew from RM17 million to RM215 million (Goldthorpe, 2015).

7.4.3.1 Industrial strategy and policy vision

Similarly to the palm oil sector, rubber based manufacturing has been identified as one of the priority-sectors across the three Industrial Master Plans, which specified targets for vertical integration, identified specific industrial products as having potential for higher value addition, and recommended areas for R&D in the rubber sector.

The IMP1 prioritized the expansion of the tyre industry, aiming to raise Malaysia's share in world tyre production to 1.5% by 1995. The IMP1 also aimed to increase local industrial consumption of natural rubber from 65,000 metric tons in 1985 to 300,000 metric tons in 1995. This target has been exceeded. In 2005, the consumption of natural rubber accounted for 43% of Malaysia production of raw rubber (ibid.).

Unlike the IMP1, the IMP2 (1996-2005) prioritized rubber-based manufacturing but did not set any specific targets for the sector. The IMP2 notably envisioned a greater role for the government in boosting R&D in rubber technology. The IMP2 recommended to diversify the range of rubber products to reduce over-reliance on latex dipped goods. It identified technology-intensive rubber-based industrial products as having potential for higher value addition. After the IMP2, Malaysia became the world's leading producer and exporter of catheters, latex thread and natural rubber gloves (MITI, 2006). The value of output of rubber products has almost doubled to reach around RM10 billion in 2005 from RM5 billion in 1996. Export earnings of the rubber industry increased by an average annual rate of 7.4%, reaching RM8 billion in 2005 (MITI, 2006).

The IMP3 (2006-2020) aims to strengthen Malaysia's position as the leading producer of latex products through additional quality control, FDI and market promotion. In continuity with previous IMPs, the IMP3 also encourages rubber product diversification and lays out measures to foster technology upgrading and skills development.¹⁶⁵ Since 2010, the government also renewed its interest in rubber-based manufacturing through the ETP, which aims to increase the country's global market share in the latex sub-sector.

7.4.3.2 Fiscal incentives for re-investments in the rubber supply chain.

In addition to fiscal incentives that are currently available for prioritized sectors and activities, the government has added further tax incentives for reinvestment in resource-based industries. Local companies in the rubber-based manufacturing sector that reinvest to expand their projects are thus eligible for Pioneer Status and Investment Tax Allowance (MIDA, 2017).

7.4.3.3. Quality control for export promotion

Because rubber-based manufacturing in Malaysia mostly targets the healthcare sector (through prophylactics such as latex gloves, condoms and disposable medical devices), the success of local firms relied on a strict quality management system to comply with international standards. Much of the growth of the rubber industry exports from the 1990s was related to a boom in demand for latex medical examination gloves and condoms in Western countries, as a the result of a worsening AIDS crisis and increased consciousness regarding the use of contraceptives (Jomo, Personal Communication, March 2017). In this period, Malaysia was the most attractive country for FDI in medical glove production as it was the world's larger producer of latex concentrate, had a well-established industrial infrastructure and strong technical support from several government funded-

¹⁶⁵ Six strategic thrusts have been set. Amongst those, the IMP3 aims to build and safeguard Malaysia's image as a supplier of quality and reliable rubber products through increased product quality control. The IMP3 also encourages outward investments for low value-added rubber products to countries with lower costs of production and availability of natural rubber. The IMP3 also aims to diversify the product range and emphasizes the development of support intermediary industries (such as rubber chemicals, tools and dies, and packaging) to enhance the linkages between rubber products and industries such as the plastics, metals, chemicals, packaging materials, machinery and equipment and automotive industries.

research institutes (Goldthorpe, 2015). These factors are directly related to government interventions in the sector.¹⁶⁶ Malaysia has since become the largest supplier of rubber medical gloves to the US market, with 30% of the market share (MITI, 2006).

However, before the increased product quality control was encouraged by the IMP3, poor quality control led to a tragedy of the commons amongst the large number of companies involved in latex gloves and condoms. “It only took one defective condom to jeopardize the reputation of the industry as a whole” (Jomo, Personal communication, March, 2017). The role of the government has thus been key in alleviating such tragedy of commons by setting stronger institutions to ensure quality control and setting up new product quality certification schemes such as the Standard Malaysian Glove (SMG).¹⁶⁷

In addition, the state, through the Malaysia Rubber Board (MRB), offers product quality testing and compliance services for local firms to maintain and improve the quality of their rubber products. The MRB’s physical testing laboratory notably undertakes tests to match domestic rubber products with International Standards (ISO) and other major consumer markets standards (Malaysian Rubber Board, 2011).¹⁶⁸ Such support is key because Malaysian products constantly face the challenge to comply with stringent standards and regulations imposed by export markets.¹⁶⁹

The government has thus played a key role in building and safeguarding Malaysia’s image as a supplier of quality and reliable rubber products, enabling to maintain the country’s position as the world largest latex goods exporter. The government has also ensured that domestic latex products meet international health and safety standards through intensified R&D activities, as discussed below.

¹⁶⁶ Between 1996 and 2005, the exports of the rubber industry increased at an average annual rate of 7.4% (MITI, 2006). Latex medical devices represented the bulk of those exports (MITI, 2006).

¹⁶⁷ The SMG was formulated by the MRB and the Malaysian Rubber Glove Manufacturers’ Association in consultation with regulatory bodies such as the US Food and Drugs Agency.

¹⁶⁸ Those include the British Standards (BS), American Society for Testing and Materials (ASTM), Japanese Industrial Standards (JIS) and any other standard requested.

¹⁶⁹ For instance, Malaysian rubber products exporters recently faced challenges to comply with new regulations by the European Chemical Agency (MIDA, 2008).

7.4.3.4 Research and Development

Malaysia now has a competitive advantage as the foremost authority in R&D in natural rubber (Goldthorpe, 2015). Malaysia's enhanced R&D capacity has been key in ensuring the productivity and quality of its domestic rubber-based industries, which need to remain competitive against low cost producers (particularly China and India) and other natural rubber producing countries (such as Thailand and Vietnam).

Following the IMP2, the Malaysian Rubber Board (MRB) was established in 1998 from a merger of the Rubber Research and Development Board, the Rubber research institute (RRIM), the Rubber Exchange and Licensing Board, the Malaysian Rubber Producers Research association and the UK-based Tun Abdul Razak Research Centre (TARRC).¹⁷⁰ The MRB became a major centre for applied research on rubber-based manufacturing. It has accumulated expertise across the rubber value chain (from cultivation, plantation management, extraction and processing of raw rubber, to rubber manufacturing techniques and rubber products marketing). Around 80% of Malaysian manufacturers use production technology developed by the Malaysian Rubber Board (Goldthorpe, 2015).

7.4.3.5 Trade promotion and market access

Various government agencies, such as the Malaysian Rubber Export Promotion Council (MREPC), the Malaysia External Trade Development Corporation (MATRADE) and the Malaysian Rubber Board (MRB), have played in key role in identifying and expanding new export markets for Malaysian rubber products. As recommended by the IMP2, MREPC was established in 2000 to promote Malaysia-made rubber products and identify new export opportunities. Trade promotion activities have targeted new regional markets, such as Latin America, Africa, West and Central Asia; as well as specific industrial markets, such as the automotive, petroleum, construction, and marine transportation industries, which offer vast end-use potential for Malaysian rubber products.

¹⁷⁰ RRIM was created in 1925 and aimed to tackle rubber-related challenges in Malaysia. TARRC was founded in 1938 and became the research and promotion centre of the MRB.

7.5 FINDINGS

The three sectors reviewed in this chapter lead to several findings on the process of resource-based industrialization.

7.5.1 Scope for diversification through resource-based industries

The vertical integration of the petroleum and rubber sectors (and palm oil sector to a lesser extent) has had a great impact on diversifying the Malaysian economy. Upstream and downstream value addition in the petroleum sector contributed to the development of new industries (petrochemicals, plastics, synthetic rubber) and strengthened linkages toward existing sectors (automotive and electrics and electronic industries). The upstream localization of the petroleum value chain has also enabled the accumulation of transversal engineering capabilities that have served other sectors (such as marine services and railway engineering). Rubber-based manufacturing enabled the development of a globally competitive latex industry as well as linkages toward other domestic industries (such as the automotive industry through tyre production). Value addition has also been pursued in the palm oil sector through palm oil refining, although further efforts are required to enable the emergence of a competitive complex oleo-chemicals and biodiesel industry.

The three case studies also show that there are great spillovers from developing resource-based sectors, both in direct terms (through value addition, export revenues, and employment generation) and indirect terms (through the generation of linkages, greater price stability, and accumulation of technological, industrial and marketing capabilities).

7.5.2 Role of the State for sending market signals towards value addition

In all three sectors, the Malaysian government has played a key role in promoting both domestic and foreign investments through various fiscal incentives (such as export duties

on crude palm oil and petroleum). By doing so, the state has successfully sent market signals to investors towards value-added resource-based activities.¹⁷¹

It is also interesting to note that direct state involvement in firms has varied amongst resource-based sectors. Government-linked companies have been actively involved in the petroleum value chain (through Petronas) and palm oil refining (through FELDA and Sime Darby), but have been much less directly involved in rubber-based industries where most champions are privately-owned firms.

7.5.3 Role of the state to support learning by doing and capabilities accumulation

In the face of major obstacles to linkage development around natural resource sectors, such as consolidated global supply chains and the lack of domestic expertise, the role of industrial policy in Malaysia has been key in providing an environment that conditioned the development of the domestic petroleum-, palm oil- and rubber-based industries. Such environment was ensured through R&D support, quality control to increase reputational and marketing value, and trade promotion in key export markets.

In terms of backward linkage development, while several countries are increasingly using local content requirements, those requirements have often led to negative outcomes. Quotas have often been either too high, scaring away investors, or too broad, enabling investors to exploit ambiguities.¹⁷² More importantly, government have often enforced or incentivized local content quotas without investing in the process of capabilities accumulation in parallel, leading to a costly trade off between local content and competitiveness. The salient challenge is thus to find the balance between local content requirements and competitive, efficient, and quality supply chain development (Grunstein and Díaz-Wionczek, 2017). As evidenced by the Malaysian petroleum industry, local

¹⁷¹ Ahmad (1990) argued that because the main objective was to encourage as much investments as possible, government officers who were responsible for approving investments, despite being guided by the priority lists, approved all investments and consequently did not favour in practice resource-based industries over other non-resource sectors. However, this does not mean that resource based industries did not receive preferential treatment as it could be argued that resource-based industries would have received less investments had they not been prioritized.

¹⁷² Morales et al (2016) show that the degree of specificity of local content framework is positively correlated with higher local content outcomes in extractive sectors.

content objectives need to be carefully adapted to the local context through a holistic approach, taking into account the combination of requirements, incentives, skills transfer (through technical and specialized universities for instances), state-led investments and learning by doing. The Petronas VDP, for instance, has been successful in enhancing the industrial capabilities of local suppliers by allowing local firms to benefit from more stable intra-industry relationships and exposure to best practices and quality standards. As a result, even though Malaysia will eventually phase out local content requirement as part of its international trade commitments, it would have build an competitive supplier base that will no longer need infant industry protection.

The palm oil sector has also become increasingly integrated throughout the value chain despite considerable artificial and natural barriers that favoured the status quo and discouraged domestic value addition (such as the European trade tariffs, Malaysia's small domestic market, lack of marketing expertise for processed palm oil, transportation to the then major consumer markets during which the quality of processed palm oil deteriorated, making re-refining necessary) (Gopal, 2001).

The development of the rubber-based manufacturing sector can also be attributed to role of comprehensive and well-crafted industrial policies, with an aggressive export promotion for key rubber products, strong R&D institutions that contributed to improve the level of competitiveness through cost reduction measures; as well as product quality control, which helped avoid collection action problems and negative externalities.

7.5.4 Price incentives

Commodity prices seem to have influenced decisions to undertake value addition in all three sectors. Petronas had decided to pursue more high value-added activities following depressed crude oil and gas prices in the 1980s and 1990s. Government-linked companies in the palm oil sector had also been incentivized to invest in downstream industries to capture more value added opportunities following the crash in commodity prices in the early 1980s. Similarly, in the rubber sector, lower prices of natural rubber incentivized domestic firms to pursue value addition towards a wide range of rubber products.

7.5 CONCLUSION

Malaysia's resource-based industrialization experience features an informative case of making the most of commodities beyond raw material exports. The country has been successful in developing and adding value to its petroleum-, rubber-, and palm oil-based industries. Against the conventional wisdom of laissez faire policies, the government played a key role in the promotion of linkages around commodities, through an aggressive industrial strategy guided by the country's industrial master plans.

The vertical policy instruments used to promote linkage development have included fiscal incentives to promote value addition alongside capacity development programmes to increase competitiveness and productivity. Targeted skills development programmes enabled to tackle labor mismatches and provide new skills required for value addition and local content processes. Government-funded R&D has enabled the accumulation sectoral knowledge and expertise, which contributed to avoid collective action problems. Quality control and product testing services by government agencies also considerably facilitated exports in key markets by reduce negative externalities for the sectorial 'branding'.

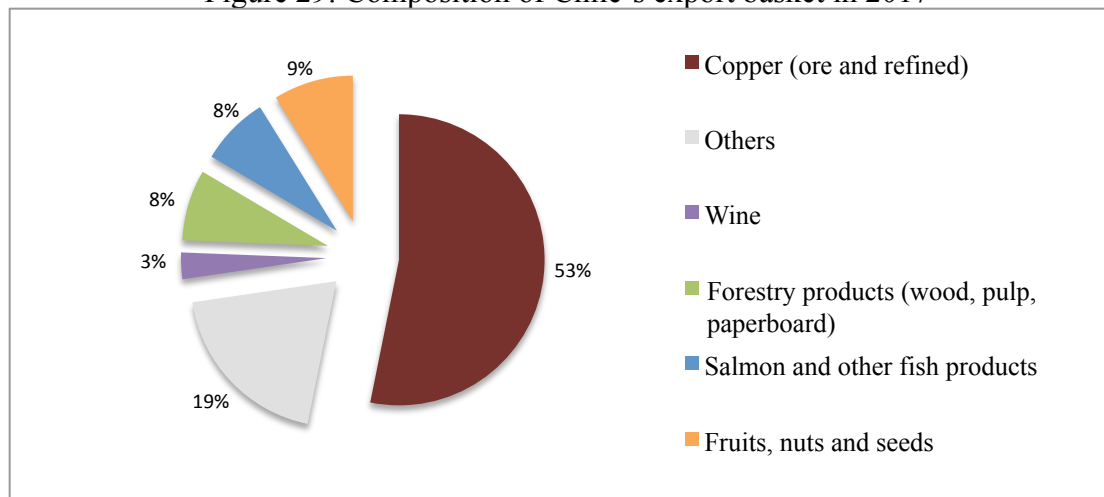
While static neo-classical comparative advantage analysis tends to condemn developing countries to low wage and labour intensive industries, a more dynamic analytical framework is needed. Dynamic approaches to comparative advantage, which devote more attention to technological upgrading, learning by doing and capabilities accumulation, are consequently more suitable in explaining Malaysia's resource-based industrialization.

Chapter 8: Chile's export diversification towards new sectors: A free market *miracle* or a free market *mirage*? ¹⁷³

8.1 OVERVIEW

Several mineral resource-rich countries have fallen into commodity dependence by failing to diversify. In contrast, Chile, despite the continuing significance of copper (accounting for over half of total exports for the past decade), has managed to diversify into other sectors and acquire new competitive advantages. Chile's largest exported products outside copper are salmon products, forestry products (wood, pulp and paper), wine and fresh fruits, as shown by figure 29. These four sectors, which now constitute the bulk of Chile's non-copper-related exports, have experienced tremendous annual growth rates of their exports, ranging from 8% to 21% per year between 1990 and 2007.

Figure 29: Composition of Chile's export basket in 2017



Source: UN Comtrade (2018)

This chapter examines whether the emergence of new products in Chile's export basket has been the result of sector-neutral horizontal policies alone or vertical policies targeting the accumulation of capabilities in those sectors as well. Analysing these factors greatly enhances our understanding of how resource-dependent developing countries can identify

¹⁷³ A version of this chapter was published in Lebdioui (2019b).

emerging market niches to transform their economic structures according to both their static and dynamic comparative advantages.

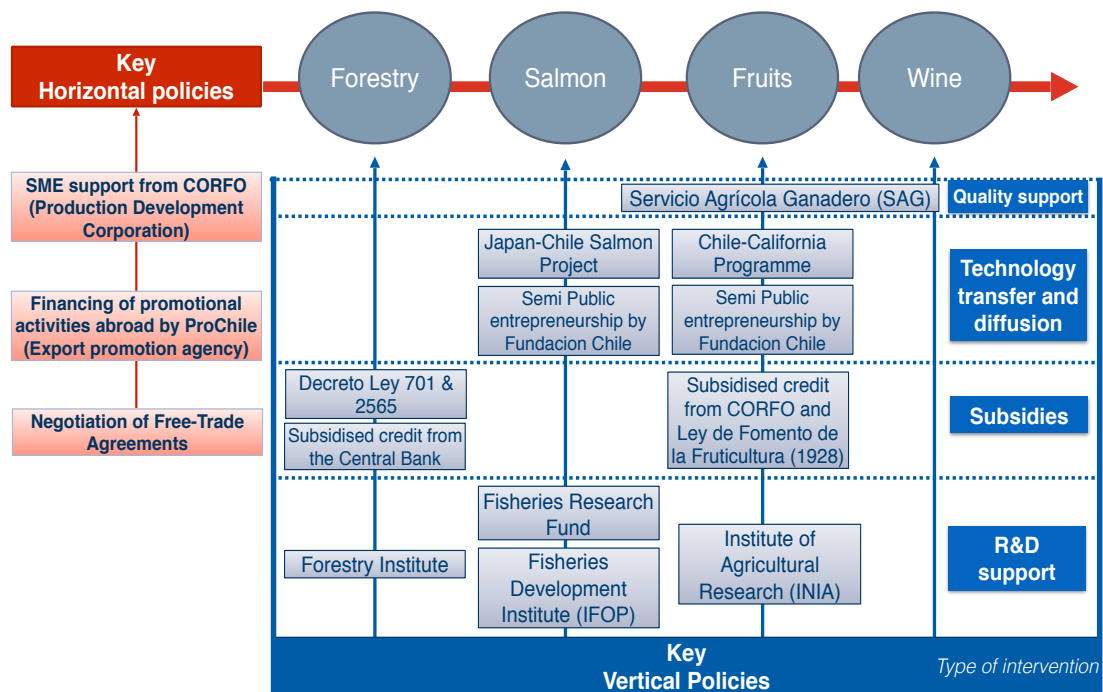
On the one hand, one of the most common and enduring myths associated with recent economic development history portrays Chile as a ‘free market miracle’, a term coined by American economist Milton Friedman (see Friedman, 1982). Such a dominant view sustains that the successful emergence of new competitive sectors in Chile’s export basket are the result of four decades of commitment to economic openness and free market policies and attributes Chile’s growth to the liberalization process during its military regime (1973-1990) and whose impact would have come into effect later from the 1990s until today. Neoliberal advocates maintain that horizontal policies suffice to promote productive transformation and that policies should be confined to comparative advantages areas: “We do not believe in the state to have a role except to be neutral [...] That is the policy in Chile and it has been successful” (Director of a think-tank based in Santiago, Chile, Personal communication, July 2017).

On the other hand, this study shows that Chile has managed to diversify and develop new competitive sectors by doing much more than laissez-faire and leaving the steering wheel to the market's invisible hand. Indeed, little attention has been given to the proactive policy interventions that have taken place in Chile. However, there are alternative accounts putting forward the instances in which the military regime was far from genuinely adopting free-market economic philosophy and actually was involved heavily in subsidizing the structural transformation of the Chilean economy (see Agosin et al. 2010; Bravo Ortega and Eterovic, 2015; Collins and Lear, 1996; Ffrench-Davis and Sáez, 1995; Kurtz, 2001; and Schurman, 1996). This chapter contributes to these scholarly works towards building a different narrative of Chile’s economic development. Specifically, this chapter does so by systematic reviewing the nature and scope of different policy interventions across all the major sectors that have emerged in Chile’s export basket since 1960.¹⁷⁴ Different policy interventions are subsequently assessed

¹⁷⁴ See table C1 in appendix C for a more general classification of some of those main industrial policies and instruments used in Chile since 1973 based on their sector-selectivity and their nature (public goods provision or market interventions).

according to their vertical nature and scope, whether they constitute the provision of public goods (R&D support, quality control services, export promotion assistance) or direct market interventions (subsidies, state-sponsored venture capitalism, etc.). Figure 30 summarizes the different forms of industrial policies that contributed to the development of the forestry, salmon, fruit and wine sectors.

Figure 30: Diagram of some of the key policy interventions behind the emergence of Chile's non-mining sectors.



Source: Author's elaboration based on in-text information

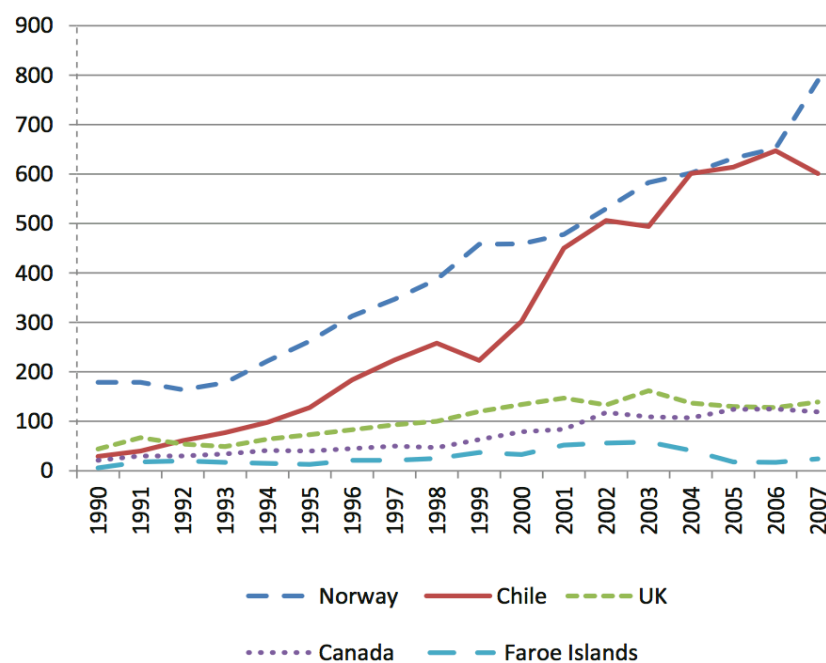
The following section features a sector-level analysis of the salmon, fruits, wine and forestry sectors. Different policy interventions are subsequently assessed according to their vertical nature and scope, whether they constitute the provision of public goods (R&D support, quality control services, export promotion assistance) or direct market interventions (subsidies, state-sponsored venture capitalism, etc.). The third section is a policy evaluation of targeted policies using a difference-in-difference method. The fourth section discusses the research findings and precedes the concluding remarks and theoretical implications of this study.

8.2 SECTOR ANALYSIS

8.2.1 *The Salmon industry*

Having started from scratch, Chile's salmon industry is now the second largest exported sector by Chile (copper being the largest), and generated direct and indirect employment for around 550,000 people by 2004 (Katz 2006; SalmonChile, 2009). Furthermore, Chile has now become the second largest salmon exporter in the world, as shown by figure 31.

Figure 31: Export volume of the salmon industries by country (in thousand tons)



Source: Iizuka et al. (2016)

While some accounts focus on the growth of the Chilean salmon sector from the mid-1980s onwards when Chile adopted an open trade policy, Hosono (2016) argues that it is important to look at the domestic capability building that took place long before which enables us to understand how the industry accumulated the knowledge necessary for its foundation. In this regard, the role of the Chilean government was crucial in several ways from the late 1960s onwards, through bilateral scientific and technical cooperation programmes such as the Japan-Chile Salmon Project (explained below), as well as pro-

active intervention from public and semi-public agencies such as Fundación Chile¹⁷⁵, CORFO¹⁷⁶, SERNAP (National Fisheries Service) IFOP (Fisheries Development Institute), and the *Servicio Agrícola Ganadero* [Agricultural and Livestock Service].

8.2.1.1 *The Japan-Chile Salmon project*

The cooperation scheme between the Chilean and Japanese governments between 1969 and 1989 relied on mutual interests. The government of Chile had identified the salmon sector as a way to alleviate the poverty faced by fishermen in southern regions of Chile, while the Japan Fisheries Association (JFA) was looking for an alternative source of salmon in the North Pacific Ocean, because of restrictions posed on fishing in the United States and the Soviet Union (Hosono, 2016; Mendez and Munita 1989). Because the Japan-Chile Salmon Project was under the responsibility of the public institutions, the technologies that were transferred, adapted or developed were considered as public goods and were made freely available (Hosono, 2016). Table 11 demonstrates how technology was introduced and adapted to enable Chile to attain a new comparative advantage. Fundación Chile and the Japan-Chile Salmon Project played a key role in addressing the investment gap required for knowledge accumulation (Hosono, 2016).

¹⁷⁵ Fundación Chile is a semi-public/semi-private foundation created in 1976 as part of the settlement for the Allende government's expropriation of the Chilean Telephone Corporation, owned by IT&T. While the government does not appoint FCh's managers, it has a large influence in the designation of its president and board of directors.

¹⁷⁶ CORFO is the Production Development Corporation of Chile (*Corporación de Fomento de la Producción*). It was created following the earthquake that struck Chile in 1939, leaving the country's infrastructure and industrial capacity destroyed. CORFO was responsible of reconstructing the country's industrial base through inward investment focused mainly on industrialization, energy, mining, fishing, agriculture and infrastructure projects. In the initial period, it participated in the funding of over 30% of investments in equipment and machinery and 25% of public investment in Chile (Durán and Fermandois, 2011). In the 1950s, CORFO represented about 70% of Chile's GDP but in 2015, the financial support deployed by CORFO amounted to around USD 3billion, which represents only 1% of Chile's GDP (Griffith-Jones, Martínez Sola and Petersen, 2015; Official from CORFO, Personal Communication, 2017). CORFO has relied on a variety of instruments ranging between horizontal and more vertical ones in nature, including public entrepreneurship, financial intermediation programmes, provision of subsidized services to SMEs, investment promotion, as well as innovation subsidies.

Table 11: Sources of contribution to the development of technologies for processing, fish disease control and feed production

		Contribution by the Japan-Chile Salmon Project	Contribution by <i>Salmones Antártica</i> / <i>Fundación Chile</i>	Contribution by the private sector
Processing technology			<i>Salmones Antártica</i> constructed the most advanced processing plants and introduced pioneering technology in 1989-90	
Fish disease control		R&D on BKD control with the most advanced laboratory equipment, and pioneering contributions in the mid 1980s.		
Food production	General	Conducted pioneering research on feed production using fish meal produced in Chile	<i>Salmones Antártica</i> / <i>Fundación Chile</i> boosted food production towards commercial sea-cage farming of salmon in the mid 1980s	
	Crumbles	Conducted research on the production of feed suitable for young juveniles that have absorbed their yolk sacs, built production equipment and ensured a stable supply.		
	Expansion pellets			Norwegian firms introduced expansion pellets into Chile through investments and the sale of equipment in the 1990s.

Source: Hosono (2016)

8.2.1.2. The role of *Fundación Chile* (FCh)

Prior to 1980, foreign companies had attempted, unsuccessfully, to develop salmon cultivation in Chile. The American company Domsea Farms and a Japanese firm invested in salmon farming during the 1970s, but their production levels and return rates were low. In 1981, *Fundación Chile* stepped in to acquire Domsea Farms, transfer technology from Norway to Chile and experiment with the farming of various salmonid species under different conditions in order to identify ways to make salmon farming commercially viable. *Salmones Antartica*, the company created by *Fundación Chile*, reached large

production scales of around 1,000 tonnes by 1988 and transmitted a clear message to potential entrepreneurs that the salmon industry was indeed profitable (Hosono, 2016). The experience of that company was then ‘copied’ by a number of nascent firms, which increased from around four companies in the 1980 to 219 in 1997 (Iizuka and Gebreyesus, 2017). Fundación Chile played a key role in the diffusion of knowledge, experience and technology, thereby attracting a large number of entrepreneurs. It offered consulting services (for instance on how to obtain a mariculture license, how to produce wooden fish cages, etc) to entrepreneurs, most of which originally had little knowledge about salmon (Hosono, 2016).

Even though Fundación Chile sold its company Salmenes Antartica in 1988, it is still involved today in several supporting activities around the salmon-farming ecosystem, such as the production of vaccines, biotesting, and quality control labs. As a result, Chile is not only exporting salmons but also products related to salmon health. Fundación Chile also set up a salmon industrial association in Chile (Mendez and Munita, 1989).

8.2.1.3 Addressing market failures in technological diffusion

One of the obstacles that had impeded the growth of the salmon sector before FCh intervened can be traced back to a collective action problem, which led to a ‘first mover disadvantage’. Indeed, once the first comer entered into this new activity, after investing in R&D in the cultivation of salmonid species, learning how to adapt salmon technology to Chilean conditions, identifying suitable cultivation areas and developing a business model, other firms could copy the business model without bearing the same cost nor undergo the same trial and error process.

Meanwhile, when investments in technological development are motivated by ambitions to gain a competitive edge in the market, private investors are likely to seek to prevent imitators from entering the competition and restrict diffusion of that technology and knowledge. The misalignment of private interests and with the social desirability of technology diffusion and emulation can be treated as a market failure.

This market failure was effectively addressed by FCh. Through its role as a venture

capitalist combined with its not-for-profit mandate, FCh allowed the free diffusion of knowledge to the wider public, which enabled entrepreneurs to copy and to emulate their success with *Salmon Antartica* without having to bear the high costs of investments in R&D. Beyond solely solving a market failure, this intervention enabled the state to send signals to entrepreneurs. As explained by the former president of Fundación Chile:

“Fundación Chile’s development of a firm producing salmon was not easy and it took us eight years. We studied why previous firms failed and solved the issue by taking all risk and bearing the cost of investing in R&D. The high risks of setting up new industries can be identified as a market failure and can be alleviated by government intervention. Fundación Chile proved that salmon cultivation was a profitable activity and used its firm as a window-case to convince Chilean entrepreneurs to get into the salmon farming business. Hence, it was a clear intervention in the market as well as public goods provision and production (Patricio Meller, personal communication, July 2017).”

8.2.1.4 R&D and human capital accumulation

The natural conditions were favourable for salmon farming in Chile but the human capital and technology were lacking. Addressing these gaps, along with the risk of investing in a new sector, would involve high costs for private entrepreneurs because training specialized professionals and R&D to sustain the industry takes time (Hosono, 2016). In order to reduce the level of risk and cost to private entrepreneurs investing in new industries, the challenge thus lay in the reduction of entry barriers, notably by ensuring the availability of specialized human capital and providing incentives for technology development and diffusion.

Salmon cultivation in Chile is a knowledge-intensive activity and founded upon extensive R&D in the area of aquaculture improvements, fish packing, storage, and other aspects of the business (Maggi, 2006). When it comes to research and development (R&D), the role of government funding was also key between 1987 and 2008 and reached a cumulative total of the equivalent of USD70 million in the salmon sector, as shown in Table 12. Such government funding in aquaculture was channeled through various grants set up by various public agencies, some of which had a sector-focus such as the Fisheries Research

Fund (FIP). Other important funding sources have come from organizations with a more ‘horizontal’ mandate such as CORFO and the National Commission for Scientific and Technological Research (CONICYT).

Table 12: Research in the salmon sector that was financed by government funding between 1987 and 2008

<i>Thematic Areas</i>	<i>Number of Projects</i>	<i>Value (in thousands Chilean pesos)</i>	<i>Share of funding</i>
Pathology and sanitary management	77	12,140,701	28.9%
Genetics and reproduction	38	7,752,516	18.4%
Nutrition and food	29	6,327,948	15.1%
Environment and clean production	33	3,842,839	9.1%
Technology centres	5	3,736,752	8.9%
Engineering and technology	44	3,489,769	8.3%
Cultivation and production	14	1,573,375	3.7%
Training and transfer of technology	18	1,026,484	2.4%
Processing and quality control	13	877,022	2.1%
Recreational fishery	10	829,549	2.0%
Administration and regulation	4	346,458	0.8%
Small-scale aquaculture	1	46,874	0.1%
Biology and ecology	1	43,043	0.1%
Total	287	42,033,330	100.0%

Source: Bravo (2009)

When it comes to human capital development, the government has invested significant resources to train specialized professionals and technicians needed by the salmon farming industry, by establishing new university programmes and technical centres. From the 1990s onwards, Chilean universities, such as the Universidad Los Lagos and University of Austral, started to provide programmes in marine sciences, biochemistry, pathology, and issues related to aquaculture production and aquaculture business administration. These two universities have supplied most of the labour market with professionals in aquaculture production and aquaculture business administration (UNCTAD, 2006b). Alongside public research institutions, the Salmon Technology Institute (INTESAL), a private institute that was created in 1995 by SalmonChile (the Salmon and Trout Producers Association) also contributed to develop the human capital and technical skills

needed for the salmon farming industry, and had trained 2,060 workers in 2002 alone (UNCTAD 2006b). INTESAL also contributed to develop and diffuse food safety and quality control technologies in the salmon industry, by applying for funding to the above-mentioned public funds.

8.2.1.5 Regulatory role to ensure sustainability of the ‘commons’.

State interventions taking the shape of public goods provision were also key in addressing other market failures in the salmon industry and ensuring the sustainability of the ‘commons’ needed for production.

Natural resource-based industries need to balance their exploitation activities with the environment’s pace of regeneration in order to avoid environmental catastrophe (Iizuka and Zanlungo, 2016). This is reflected by the Chilean salmon sector, which has been affected by a tragedy of the commons, which is defined as a problem in which every individual has an incentive to consume a resource at the expense of all other individuals. Indeed, overexploitation of the waters resulted in sanitary and environmental deterioration leading to the Infectious Salmon Anemia (ISA) virus contamination in 2007. As a result, Chilean Atlantic salmon production decreased by 65% between 2007 and 2010, while the number of workers decreased by 40%. This sanitary crisis reflects a tragedy of commons in the absence of adequate regulatory mechanism monitoring environmental impact (Iizuka, and Katz, 2010). Since then, policy efforts have been needed to intervene and create changes in existing institutions surrounding the salmon farming industry to ensure sustainability. Regulatory institutions have been set up, notably through the implementation of the Aquaculture law in 2010. In order to reduce the systemic risk of new diseases in the future, the National Fisheries Service (Sernapesca) also required salmon farming firms to group their cultivation centers into *barrios* according to geographical location, and obliged firms operating in cultivation centers within the same barrio to synchronize their production calendar (to provide for a three month resting period) to facilitate sanitary controls aimed at minimizing the transit of navigation, often instrumental in transmitting pathogens (Iizuka and Zanlungo, 2016).

The Chilean case thus demonstrates how natural resource-based activities need to be supported not only by advanced production technology, but also by scientific knowledge of the local environment to establish appropriate local regulatory institutions to manage the use of common resources (Iizuka and Zanlungo, 2016; Katz, 2016). Such local regulatory role can be seen as an input that has public goods characteristics and thus will be under-provided by the market.

8.2.2. The fruit sector

In the 1960s, Chile's fruit exports were mostly limited to two types of products (grapes and apples). Today, the country exports more than 20 types of fruits and has become the largest fruit exporter in Latin America. One of Chile's advantages lies in the fact that it is located deep in the southern hemisphere and consequently experiences seasons at opposite times of year from the northern hemisphere, where the largest consumer markets are located. However, this seemingly clear natural advantage determined by geographic location has not developed organically through market forces only. Indeed, the most important catalysts for the production of new fruits in Chile can be traced back to several vertical interventions. A fruit development plan was carried out in the late 1960s by CORFO, the national production development corporation (Bravo-Ortega and Eterovic, 2015). As further detailed in the following section, Fundación Chile has also invested in R&D since 1980 to catalyse the production of berries, while the University of Chile and the Institute of Agricultural Research (INIA) have set up technical training in order to address human capital shortage inhibiting the growth of the fruit sector.

8.2.2.1 The Chile-California Programme and its underlying governmental vision

Given that the absence of adequate human capital was for a long time the obstacle for the development of the Chilean fruit sector, the promotion of targeted and specific skills was key to the emergence and export-orientation of the sector (Agosin and Bravo-Ortega, 2009). The most important example of this is the Chile-California Programme, an exchange programme established in 1965 between Universidad de Chile and University of California and funded by the Ford Foundation. The Programme entailed sending more than 80 Chilean graduate students to study agricultural economics in California in order

to learn how to cultivate and export fresh fruits in Chile. The Ford Foundation spent USD9.75 million to fund this programme over a period of 10 years (which adjusted to today would be equivalent to USD 200million). This appears to have been an extremely successful and impactful grant considering the growth of the sector during the following decades (Bravo-Ortega and Eterovic, 2015)

This successful intervention may have been financed by a private foundation but it remains a vertical intervention nonetheless as it contributed to providing what could be seen as a public good that oriented market forces towards the growth of specific industry. In addition, while this Chile-California programme is very often credited to the Ford Foundation instead of being considered as a governmental initiative, a closer examination of the context in which it emerged suggests that the story is far more complex and that the design and scope of the Chile-California programme was guided by public agencies.

Indeed, an examination of the archives of the State of California reveals that the origins of this programme and its design were clearly governmental. Between 1963 and 1978, it is the governments of Chile and California that took the initiative to undertake three programmes of development assistance and cooperation, spurred by the two regions' striking similarities in physical geography and natural resources (Bauer and Catalán, 2017). In fact, the Californian task force that decided in 1963 to start a technical cooperation programme with Chile, following President Kennedy's suggestion, "responding directly to the wishes of the Chilean Government" in the definition of core areas for cooperation, such as agriculture, education, water resources, highway transportation, planning and budgeting (California State Archives, 2000, para.3). The signing of the exchange programme between Chile and University of California took place two years after the Californian task force set up to develop a partnership with Chile had first met with Chilean policy-makers to identify core areas of partnership. Given the chronology, it is likely that the governmental cooperation programme has influenced the signing of the university exchange programme between Chile and California.

It is also important to understand the context in which the Chile-California Programme took place as well as the context of the Ford Foundation's involvement. In the aftermath

of John F. Kennedy's election, the agenda of international cooperation through the US Agency for International Development (USAID) increasingly emphasized the role of university exchanges and the development of technical skills in Latin America as a motor economic development (USAID, 1962). Private foundations such as the Rockefeller and Ford Foundations aligned their thinking with USAID and re-oriented their focus towards technical training and modernization of universities overseas (Fuenzalida, 1984). When Governor Reagan discontinued the technical cooperation programme with Chile in 1967, only the agricultural element of the programme was to remain active, although federal funding for that programme was also discontinued. Perhaps this is when the Ford Foundation became increasingly involved in replacing the federal funding for this part of the programme. Even then, the agreement between the Universidad de Chile and the University of California clearly stated that the two universities should be responsible for formulating the specific programmes and present joint proposals to foundations or government agencies if there is a need for external funding (Fuenzalida, 1984: 96). Consequently, while the Ford Foundation provided the funding for the proposal, the design of the intervention and the decision to target the fruit sector are to be credited to the Chilean policy-makers and public education institutions.

Tinsman (2013) also analyses the even earlier historical roots of the programme and provides a detailed account of the emergence of the fruit sector from 19th century onwards, which sheds light on the important role played by the government. As Chile's nitrate industry suffered from the invention of synthetic nitrate during the World War I, Adolfo Ibáñez, Chile's Minister of Economic Development at the time, proposed that fruit exports could replace nitrate as Chile's primary source of wealth and identified international demand for fruits in the United States and Europe (ibid.).¹⁷⁷ The government thus played a major role in the identification of Chile's potential competitive advantage in fruit production. In addition, well before the Chile-California programme, Chilean policy makers looked to the United States not only as a future market but also as a model

¹⁷⁷ In the early 20th century, nitrate was the backbone of the Chilean economy, accounting for about 80% of world production, 60% of its exports and 80% of government revenue, before the development of synthetic nitrogen in Germany ended Chile's monopoly of world nitrates and crashed the Chilean nitrate industry (McConnell, 2008).

for building their fruit industry (ibid.). In 1922, Mr Alessandri, the President of the National Agricultural Society (who also was a sitting senator) led a state-financed commission to tour California, after which he compiled a report in which he admired and praised the strong government role in developing agriculture in California:

“Alessandri identified the mysterious force at work in California not as the market’s invisible hand but as the enormous presence of the U.S. Ministry of Agriculture, which he praised as ‘one of the largest, most complete and admirable [ministries of agriculture] in the world’. By contrast, he bemoaned, “How enormous has been the wealth lost by Chile for lack of a [national] policy that should have been unceasing and tenacious in its promotion of production!” Alessandri reassured his audience that Chile had every potential to reproduce California’s success since it possessed an almost identical climate and fruit-growing tradition. But this would be possible only with significant state involvement.” (Tinsman, 2013:32)

The role of state planning was particularly emphasized in Alessandri’s report:

“All of this [California’s agricultural development] is owing to the fact that [in California] the orchard plantations obey a scientific agricultural plan, via which each region is planted only with those trees that are best adapted to the conditions of climate and soil, in other words, those that are capable of producing the most dollars per hectare.” (Alessandri 1923 cited in Tinsman 2013:32).

A critical historical perspective on the development of the fruit industry consequently shows that the vision underlying the Chile-California programme was clearly governmental.¹⁷⁸ In addition, it is important to point out that the Chile-California was part of a broader set of policy intervention towards developing the Chilean fruit sector, as explained in the next sub-section.

¹⁷⁸ Interestingly, while “Chicago and California philosophies overlapped on the imperative of making agriculture more efficient and promoting exports, but they had dichotomous visions of the state” (Tinsman, 2013:47). Indeed, while most Chileans who studied in California during the 1960s and 1970s had prepared for careers in the public sector following the government-directed National Fruit Development Plan, Chileans studying in Chicago learned about the disasters of state-led projects and the need to minimize government involvement in economic life (ibid.)

8.2.2.2 Earlier state involvement and planning since the 1920s¹⁷⁹

As outlined by Tinsman (2013), the Chilean state took several immediate actions following the recommendations of a report by the Minister of economic development (Adolfo Ibáñez) in 1927 to develop the fruit sector. First, a ministry of Agriculture was created in 1925, including a special ‘Fruit Tree and Vineyard’ Service tasked with “promoting and developing fruit plantations, in technical form and the creation of markets” (ibid.). Three years later, the government passed the Law for Fruit Development (*Ley de Fomento de la Fruticultura*), which allocated 10 million Chilean pesos for five years to subsidize new vineyards and orchards as well as canning and packing facilities. In 1938, the University of Chile established the School of Agronomy, which included a special course for fruit cultivation. In 1939, CORFO began providing special credits to fruit growers and was also charged with drafting a national agricultural-development plan wherein fruit exports were central. This plan, which aimed to increase total fruit production fivefold within 15 years, was expected to use funding worth USD18 million from both public and private sources to pay for credit incentives, technical support, infrastructure, and commercialization of fruits abroad, but in practice the plan had its greatest impact using credit from CORFO and the Chilean Central Bank (ibid.). The National Fruit-Development Plan was accompanied by the Chile-California programme, but also by the Inter-American Development Bank that supplemented Ford Foundation funds with USD4 million to build a new agricultural and forestry campus at the University of Chile (ibid.)

As a result of these public policies, the amount of land planted with orchards and table-grape vineyards expanded almost fourfold and the size of fruit exports grew nine-fold between 1930 and 1975 (from 4,500 to 38,300 metric tonnes), when the military began dismantling agrarian-reform programmes (ECLAC, 1990; Tinsman, 2013).¹⁸⁰ However,

¹⁷⁹ The role of agrarian reforms on the fruit sector development and productivity is also important but could not be fully discussed in this chapter due to length considerations. For a detailed account of state-led agrarian reforms and how they boosted fruit cultivation and productivity throughout successive political regimes since the 1960s, see Tinsman (2013).

¹⁸⁰ Meanwhile, between 1974 and 1986, during the military regime, the state spent more than USD27 million on expanding fruit-irrigation systems (Tinsman, 2013:49)

fruit exports grew almost tenfold (in metric tonnes) after a decade of military regime, ‘but the exponential growth in the 1980s was partly afforded by fruit trees and vineyards that were planted in the late 1960s and early 1970s but took three to seven years to mature’ (Tinsman, 2013:39).

8.2.2.3 The role of Fundación Chile (FCh) in the 1980s

The cultivation of berries in the South of Chile was another a successful area of innovation pioneered by FCh, with a similar approach to what was used to catalyse the salmon sector. FCh identified which fruits are produced in similar climatic conditions as Chile and subsequently created a firm in 1980 called *Berries la Union*, which became the largest exporter of blueberries in Chile (FCh manager, Personal Communication, 2017). Even though this firm later went bankrupt (after FCh exited the business), its demonstration effect was very important and sufficed to show entrepreneurs that the cultivation of berries in Chile was possible. Chile’s blueberries exports reached USD 380 million in 2011 (Retamales et al. 2014). This investment, through what could be considered as public entrepreneurship, resulted in the introduction and development of a new product as well as new transversal technologies and capabilities, including cold storage systems, which are required to ensure product quality.

8.2.2.4 Quality control and export promotion

A government agency called Servicio Agrícola Ganadero (SAG) was set up to control the export quality of fruits produced in Chile. The role of SAG was a key factor influencing the performance of the entire fruit sector. SAG was responsible for disseminating information on phytosanitary standards in importing countries so that individual producers could comply with them and request technical assistance.

In addition to quality control to facilitate exports, the government's promotion of Chilean exports was also supported by ProChile, the government’s export promotion agency, as well as the diplomatic action in the negotiation of free trade agreements. Such FTAs can be considered as a provision of a public good (albeit only for some of the existing sectors), and have been considered by most executives of Chilean exporting companies as

an important factor in stimulating the export of Chilean fruits (Agosin Agosin and Bravo-Ortega, 2009; Meller and Zenteno, 2013).

8.2.2.5 Technology transfer and Research Institutes

In addition to Fundación Chile's mandate, the Chilean government also set up institutions to promote technological upgrading in the fruit and agriculture sector more broadly. It created the Institute of Agricultural Research (INIA) as well as a technology transfer programme (GTT), with the purpose of creating synergies between agricultural producers and research institutes to facilitate the adoption and dissemination of foreign knowledge and technologies by local farmers (Grosse, 2009:180). CORFO has also financed cold-storage and fumigation facilities required for fruit exports.¹⁸¹

8.2.3 Wine sector

8.2.3.1 Technological upgrading in an existing industry

Before its emergence in the Chile's export basket, wine was already produced in Chile for two centuries. Between 1938 and 1973, wine production was restricted by the government, heavily taxed and mostly aimed for domestic consumption (Grosse, 2009). However, in 2016, wine exports reached almost USD 2 billion (UN Comtrade, 2018).

In the late 1970s, growing investments from foreign firms, particularly the Spanish firm Miguel Torres, looking for ideal climatic conditions, played a key role in the introduction of new methods of production that were inexistent in Chile such as the use of stainless steel containers imported from the United States, as well as modern grinding and pressing machinery (Meller and Zenteno, 2013). The success of Miguel Torres was followed by increasing foreign investments as well as joint ventures from the 1980s onwards, enabling Chilean producers to access foreign markets and international distributions channels while further learning how to adapt their production to the demand of foreign consumer markets (ibid.: 150). The import of foreign technology was thus a crucial factor

¹⁸¹ Beginning in 1967, it built five refrigerators, which accounted for 70% of all cold-storage capacity in the country by 1972 (Tinsman, 2013)

in the development of wine exports (Agosín and Bravo-Ortega (2012). According to data provided by UN Comtrade (2018), this process enabled Chile to go from being a minor participant in the international wine business to becoming the fourth largest exporter of wine in the world today.

While the climatic conditions for cultivating grapes and producing wine had existed for centuries, the export orientation and upgrading came from the introduction of new skills, technology, support from public agencies (such as CORFO, ProChile and SAG), and government policy (Grosse, 2009:180). In fact, it is interesting to note that the foreign investments in the wine sector came after the interventions to develop Chile's fruit sector, including grapes, which represented an major part of the fruit industry at the time. Perhaps the foreign investment inflow that contributed to developing Chile's wine sector was also partly motivated by the existing quality and supply of grapes, and could consequently be related to the successful interventions leading the development of the fruit industry from the 1970s onwards. I have not been able to find data confirming the Chile California Programme's effect on both wine grapes and table grapes cultivation, but it can be presumed that in theory the cultivation and agro-science skills developed through the Chile California programme could have been equally applied to the cultivation of wine grapes and table grapes.

8.2.3.2 Role of government programmes

More importantly, even through the export-orientation of the wine sector was FDI-led, the government played a key role from the 1980s onwards in intensifying the sector's export performance. Indeed, the government has set up several programmes to subsidize export-oriented production across sectors, notably through its Production Development Corporation (Corfo), which set up a supplier development programme that helped small producers adapt the quality of their products to international standards. ProChile, the government's export promotion agency, financed nearly half of total costs related to promotional activities of the Chilean wine sector abroad, including trade fairs, travel costs and marketing brochures and equipment.

Nevertheless, it is worth noting that most of these interventions were horizontal. Indeed, neither ProChile nor Corfo singled out the wine industry and the support they offered was available to all industries wishing to receive it (Grosse, 2009:180). Meller and Zenteno (2013) further put forward that Chilean wine producers acknowledged the existence of certain ‘public goods’ as essential for increasing their exportations, such as the negotiation of phytosanitary agreements, the protection of the environment carried out by the SAG, the promotion of business associations, and the establishment of FTAs.

8.2.3.3 Quality control and export promotion

Similarly to the government’s response to the tragedy of the commons leading to the salmon diseases, the wine sector has also witnessed greater role of the state to avoid negative externalities when some producers were using chemicals which could hurt the image and branding of the Chilean wine industry as a whole (Former President of Fundación Chile, personal communication, July 2017). This view of the role of the Chilean state role in preserving the value of the national brand through regulation is in line with Iizuka and Katz (2010) analysis of the regulatory role of the State.

8.2.4 The Forestry industry

One of the areas that the Chilean government has targeted most explicitly is the forestry sector, through a mix of policy interventions including laws, incentives, subsidized credit lines and other tools to attract private investments in the sector. As shown by Agosin et al. (2010:7), “the military government made a strategic bet on a non-existent but potentially profitable sector. It had long been known that radiata pine grew faster in certain parts of Chile than practically anywhere else in the world. The authorities in effect solved a coordination problem that made this sector take off.” Today, exports of wood and paper products represent about USD5 billion, which accounts for about 9% of Chilean exports (UN Comtrade, 2018).

8.2.4.1 Subsidized credits and incentives for reforestation

The Chilean authorities have successfully targeted the forestry sector through several tools and legal interventions. One of them was *Decreto Ley 701*, a law passed in 1974 recognizing the importance and necessity of developing the forestry sector for the domestic economy. The law also granted cash subsidies of 75% of the costs of planting and the initial management of forests (Decreto Ley 701, 1974). The Central Bank also provided incentives and subsidized credits for investments in the forestry sector (managed through public and private banks) between 1974 and 1979. Such subsidized credits were effectively used by specialist professionals, most of whom recently graduated from two Chilean universities that offered forestry engineering programmes, for the planting and replanting trees for commercial exploitation, including wood and pulp exports (Rossi, 1995).

It is interesting to note that measures were also taken to ban the exploitation of forest trees younger than 18 years old as well as the exports of raw wood and debarked logs. Rossi (1995:117) highlights that the Central Bank additionally required quality certificate rendering wood export a very difficult task. As a result, the market for raw wood became less export oriented and turned towards the internal market. This measure benefited the domestic cellulose and paper industries, which took advantage of low raw material prices. According to Rossi (1995), this measure discouraged investments in plantation or forestation. Nevertheless, it would seem that those impediments were effectively counterbalanced by financial incentives offered by the Decreto Ley 701 and the Central Bank for further plantations. It is thus clear that the Central Bank of Chile played a key role in artificially controlling market prices in a way that benefited domestic value addition and the growth of industries around the forestry sector.

8.2.4.2 *Debt-Equity Swaps Programme* ¹⁸²

Another intervention, which is less vertical in its design but that ended up benefiting the forestry sector in particular, was a programme of debt equity swaps in 1985.¹⁸³ This programme acted as an important subsidy for investing by buying debt as it involved the sale of a bank's loan at a discount rate. While the programme did not explicitly target any specific sector, it appears that the Central Bank's approval of all debt-equity swap arrangements also stipulated and ensured that proposed investments would generate foreign exchange and create wealth (Bridges, 1987). The biggest debt-equity swap by far was carried out by the New Zealand company Carter Holt Harvey, who in 1986 bought \$160 million of Chilean debt which it then converted into pesos and invested in the forestry industry (ibid.). The programme also attracted investments from other New Zealand leading producers of wood fibre and forestry-based products such as New Fletcher Challenge (Shirley, 1988). The programme thus benefited the forestry sector in particular. Given that the Central Bank's had to oversee and approve proposed investments involving debt-equity swaps, it is reasonable to suspect that the forestry sector was seen as a priority area with potential to generate foreign exchange. In addition, given that the Central Bank had already been giving incentives and subsidized credits for forestry plantations before 1985, the fact that the largest investors selected and approved for the debt-equity swap programme by the same Central Bank were in the same forestry sector is perhaps not a coincidence. In addition, the sequencing of those policies and investments appears to be very timely. While the Central Bank's subsidies targeted the radiate pine plantation development, enabling availability of raw material, the later investments as part of the debt-equity swap stimulated the industrial process to transform the developing forestry sector into value-added wood products such as fibreboard.

¹⁸² The impact of the Debt-Equity Swaps Programme for the forestry sector was pointed out to me by Manuel Agosin during a fieldwork interview.

¹⁸³ The debt-equity swap programme was introduced by Central Bank of Chile in 1985 as a way to reduce external debt while attracting investments. The buyer of the loan converts the earnings into the debtor's currency and invests it in that country. In other words, the debt holder gets an equity position in exchange for cancellation of the debt. Thanks to the debt-equity swap programme, Chile's total external debt declined by about USD740 million between 1985 and 1988, while its GNP grew by 43% in that period (Cole 1992:69).

8.2.4.3 R&D

The Forestry Institute, or *Instituto Forestal* (INFOR) was officially created by the Government of Chile in 1965. It is a technological research institute attached to the Ministry of Agriculture of Chile and has been the first institution responsible for conducting research and development in the forestry sector, in areas of forestry economics and wood-related technologies.

8.2.4.4 Impact of policy interventions

The different policy tools reviewed above that were used to promote the forestry sector were extremely successful. Public expenditures through subsidies and grants in the 20 years of application of the law *Decreto Ley 701* amounted to USD 135 million. Meanwhile, the total private investments in the forestry sector in the same period reached USD4 billion and total forestry exports rose from USD 127 million in 1974 (year of enactment of the *Decreto Ley 701*) to USD 1.5 billion in 1994, when the terms of the law ended (Rossi 1995). While it appears that the main motivation behind its promotion was the exploitation of the country's natural resource endowment, it is important to note that Chile's considerable forestry endowment, with over 1.5million of hectares of plantations, and more especially its radiata pine abundance, was man-made.

It is interesting to note that, as the state gradually abandoned wood production and the management of forestry plantations, more sophisticated and value added products have been developing slowly (Agosin et al., 2010:7). For instance, wood furniture exports, which increased fiftyfold from USD 500,000 in 1985 to USD 23.3 million in 1994 (Rossi, 1995), have since been stagnating.

8.3 POLICY EVALUATION USING A DIFFERENCE-IN-DIFFERENCE METHOD

One of the counter-arguments to the argument of this article emphasizes that Chile's seemingly successful interventions targeted sectors in line with Chile's comparative advantages, and which were already bound to emerge as successful exports. Preliminary assessments considering state interventions as successful would then be based on a selection bias. The question should thus not be whether successful sectors today have benefited from government interventions, but instead whether they would have been successful without government interventions (Bravo-Ortega and Eterovic, 2015).

Firstly, the fact that only few sectors (such as the wine sector) have emerged as major exports without benefiting from vertical interventions is a first indicator that there is also little evidence to support the counter-argument that free market forces are behind Chile's diversification outcomes. Second, because it is difficult to build an exact counterfactual, it would be useful to conduct an impact evaluation of Chile's vertical interventions by using a difference-in-difference estimation (DiD). The use of this method has been widespread in the study of the impact of policies on a certain outcome in a natural experiment using observational and longitudinal data (Angrist and Pischke, 2008).

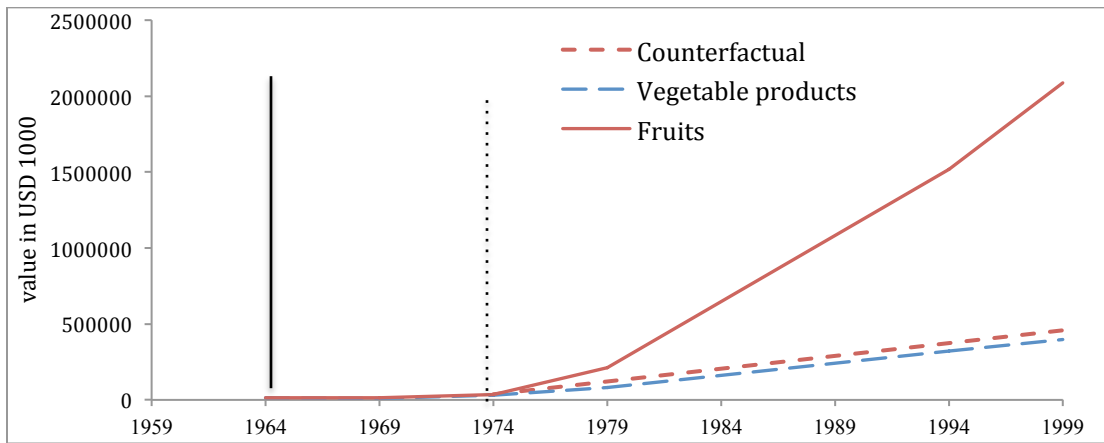
I have looked at the effect of vertical policies on different sectors by using the value of exports as the outcome variable. While several factors can impact a sector's level of exports, including other policies that might have been implemented at the same time as the ones I am evaluating, I have reduced the level of bias by choosing control groups that are sub-sectors within the same sector but that did not benefit from vertical interventions to the same extent as the treated group, in order to plot a trend before and after the intervention (t_0). I have conducted two comparisons.¹⁸⁴ The first one of the fruit sector with vegetable exports as the control group because the fruit and vegetable sectors benefit from similar conditions and are affected by similar natural factors. Hence, they would be no reason to believe that one sector would perform better than the other without differences in accumulation of capital investments, human capital and technological

¹⁸⁴ See appendix D for the compiled data used to undertake the DiD policy evaluation.

upgrading. The selection of the wine sector as control group would have perhaps provided different results but because the wine sector directly relates to grape cultivation, the externalities from the interventions in the fruit sector towards the wine sector might be high. The use of the vegetable exports thus constitutes a more adequate control group. The second comparison is that of the salmon industry with other fish exports.

8.3.1 *Fruits and vegetables*

Figure 32: Evolution of Chilean exports of fruits and vegetables between 1964 and 1999



Source: Author's calculations based on Center for International Data (2018)

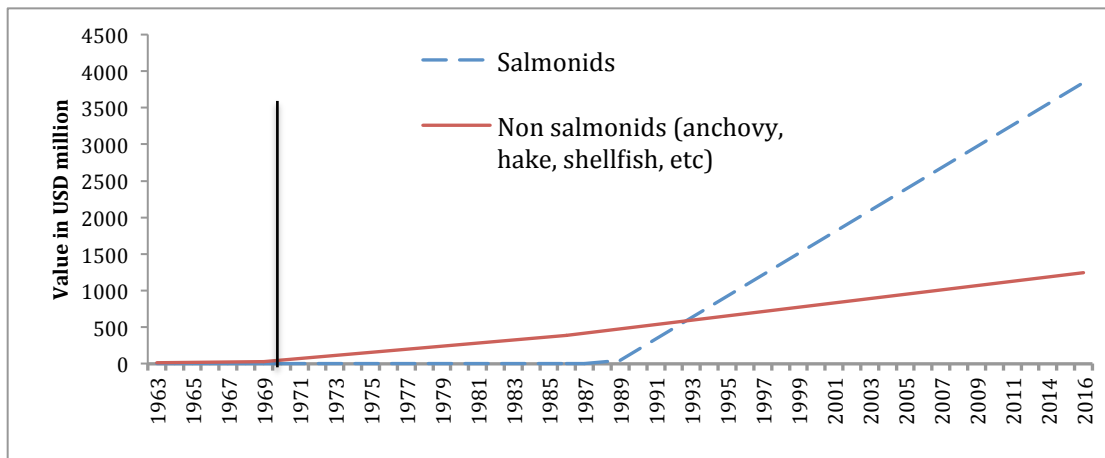
8.3.1.1 *Methodology and Interpretations*

Using Standard International Trade Classification (SITC4) data, I have singled out fruit products (code 057 and 058) and vegetable products (code 054, 056 and 292). The fruit sector has received several interventions, from the late 1920s to the 1980s but the major interventions started in 1965 with the Chile-California programme and subsequently FCh's intervention in 1980. The earliest data point that is available is 1964, not allowing proper comparison before treatment in figure 32. Nevertheless, the dashed line in the graph between t_0 and t_1 represents the year 1974 which could be used as an alternative t_0 . There is indeed a solid basis for assuming that the interventions would not yet have had any effect on the treated group (fruit sector) by 1974 due to the lag after which the intervention would come into effect (time of implementation of the cooperation programme, followed by the duration of full academic courses and exchange

programmes, the lag to translate the newly acquired capabilities into practice, as well as the years that it took from fruit trees and vineyards planted in the late 1960s to mature. Interestingly, both the treated and non-treated group had very similar growth rates between 1964 and 1974. The fruit sector experienced an annual growth rate of 11% while the rate was 10% for vegetable exports. Consequently, it is highly plausible that fruit exports would have experienced a similar growth trend as vegetable exports if there was no intervention during the period 1965-1980. Between 1974 and 2000, the vegetable sector continued to grow steadily at a 10.6% annual growth rate. If the fruit sector had grown at the same rate as pre-1974, it would have reached an export level of around USD 480 million in 1999 while fruits exports actually exceeded USD2 billion. According to this DiD estimation, today's fruit exports represent more than four times what they would have been without the vertical intervention. In other words, 80% of current fruit exports can be attributed to the clearly successful interventions in the fruit sector.

8.3.2 *Salmonids and other fish exports (anchovy, hake, shellfish, etc.)*

Figure 33: Evolution of Chile's exports of Salmon products and other fishery exports using the DiD method (in USD million)



Sources: Author's calculations based on data provided by SalmonChile's database (2009, 2018), UNCTAD (2006b), Achurra (1995), Feenstra (2018) and UN Comtrade (2018).

8.3.2.1 *Methodology and Interpretations*

One of the issues faced in this DiD estimation was the lack of disaggregation of the product classifications for specific fish species in both SITC (Standard International

Trade Classification) and HS (Harmonized System). I thus relied on different sources, such as SalmonChile, the Chilean Customs Authorities and UNCTAD, to gather and cross-check data on Chile's salmon exports.

The cooperation scheme between the Chilean and Japanese government started in 1969 while FCh's entry into the salmon industry took place in 1981. Consequently, the year 1969 is used as t_0 . I cannot estimate the similarity of growth trends before t_0 until 1986 because salmon exports were non-existent before the intervention. Nevertheless, just as in the case of fruits, the selection of other fish species within the same sector as a control group is motivated by the reduction of bias, caused by natural factors and industry trends.

According to my calculations, the growth rate of non-salmonids exports reached about 7% in the period 1969-2016 and 4% in the period 1986-2016. Meanwhile, the annual growth rate of salmonid products from their emergence in the export basket in 1986 until 2016 was about 25%. If salmonid exports had grown at the same pace as non-salmonid exports for the entire period (1969-2016), they would have reached USD50.35 million in 2016. Instead, salmonid exports accounted for USD3.844 billion in 2016. There are thus solid reasons to believe that the interventions in the salmon industry were very impactful and enabled it to grow above the fish sector's average.

8.4 FINDINGS

Several lessons on the role of policy interventions for export diversification can be drawn from this chapter's analysis of Chile's diversification since the 1960s. A number of elements, such as adequate human capital availability, research and development, and environmental sustainability, that are crucial for a sector's development, are difficult to manage without policy interventions.

8.4.1 Role of the state as catalyst of human capital accumulation

This study has shed light on the role of investments in human capital to address shortages in the skills required for the development of new industries. Specialized human capital accumulation in Chile was promoted through technical training programmes and university programmes in fields related to the now-export oriented sectors, such as

marine sciences, fruit and agricultural science, forestry engineering, etc. As shown in the copper sector in chapter 6, when institutions for training specialized personnel are lacking, or when particular skills are not provided by the public sector, private firms either cannot grow due to the absence of skilled human capital or have to train the necessary personnel in-house, which leads to high non-recoverable costs, if trained employees leave the company. This is why governments have a role to play in the creation of training programmes in anticipation of future and current skills needs.

8.4.2 Role of the state as venture capitalist

Indeed, even though pioneers can gain significant sales advantages, head start in learning, and reputational advantage, as argued by Schumpeter (1942), Boulding and Christen (2001) have found that they can in some circumstances incur even larger cost disadvantages, while firms that follow pioneers can have some cost advantages as they can learn from the mistakes and successes of their predecessors, reducing their own investment requirements as well as their risks, potentially leading to a free rider problem¹⁸⁵. As a result, while technology diffusion and the presence of ‘followers’ can bear high social and economic returns for the sector as a whole, private investors are less likely to invest in a new industry if technologies that have been developed over much time and expenses are likely to be copied or are not sufficiently protected by intellectual property control, because it would weaken confidence that sufficient profit will be generated in compensation for the high risks and costs of R&D (Hosono, 2016; Rodrik, 2007). Private investors are thus likely to seek to prevent imitators from entering the competition and restrict diffusion of that technology and knowledge (through patents and other means). In such situations, the private interests of innovators do not match the socially desirable outcome of technology diffusion and emulation.

In that context, the role of the semi-public agency Fundación Chile, through what could

¹⁸⁵ Perhaps it is easier for other firms to free ride when first movers adapt imported technology instead of developing their own technology: *Emulating* first-movers thus might not have as much knowledge advantages as the first movers that are *genuine* innovators. A discussion of the determinants that renders industries prone to a first mover advantage or disadvantage is beyond the scope of this thesis.

be considered as semi-public not-for-profit venture capitalism, sheds light on the scope for vertical interventions to promote the diffusion of knowledge acquired through R&D and industrial trials not as a public good. FCh's role has thus consisted in sending market signals in promising industries that would not develop through market forces alone. This type of intervention can be considered as a mechanism to explore new products and promote nascent infant industries. FCh consequently faces a tradeoff between profitable investments and risky ones that would be less profitable but that could have a higher social returns (Agosin et al., 2010). In total, Fch has created around 70 firms.¹⁸⁶

8.4.3 Role of the state for Trade promotion

Another aspect relevant to the development of Chilean exports lies in the government's role in the opening up to foreign markets for Chilean products. Such interventions involve diplomatic action in the negotiation of free trade agreements (FTAs), sanitary agreements for food exports, as well as the creation of export promotion agencies such as ProChile, which has been assisting Chilean companies in their participation in trade fairs, etc. Those efforts of trade promotion started in the 1980s because few countries were willing to trade with Pinochet's military government. At first, one could consider the state's trade promotion as a provision of a 'public good' of a horizontal nature. That said, such trade promotion appears to be very targeted as it focused on foodstuff and benefited existing sectors, at the expense of infant industries and manufacturing. Indeed, Meller and Zenteno (2013) also note that the negotiations of sanitary agreements with importing countries also was a key element for the growth of certain exports, especially food-related products, which are particularly impacted by sanitary and phytosanitary standards.

8.4.4 The quality control role of the state to ensure 'national' reputation

The government's role is also crucial in reducing negative externalities that can impact a whole industry's reputation and exports. The Chilean state had to ensure quality control of salmon, fruits and wine producers. In the case of the wine sector, for example, Bordeu

¹⁸⁶ Some of the commercial projects pioneered by FCh had no followers (such as in furniture production), while others (such as berries cultivation) were not commercially successful but had several followers and thus high returns for the Chilean economy (Agosin et al., 2010).

(1995) shows that wine consumers tend to associate product quality with the country of origins. Poor quality from a single wine exporter, or the use of chemicals, could hurt the branding of the Chilean wine industry as a whole. There also seems to be an asymmetry because while it is very easy for a few wine exporters to damage the sector's reputation, it is difficult for few firms to enhance the sector's branding on their own. Indeed, if some firms investing in quality improvement end up increasing reputation for all Chilean wines, other producers that have not raised quality might attempt to charge higher prices, which would in turn damage the sector's reputation. In contrast, if all producers improve their quality, there are large reputational increases for the country's branding that few firms on their own might be able to achieve. Hence, enhanced product quality control can have a considerable impact in increasing the value of a product, such as Chilean wine, by allowing the sector to target niche markets with higher prices (Meller and Zenteno, 2013). In Chile, the role of public agencies such as SAG or the Chiquihue Foundation was key to uphold export quality standards in the fruits, wine and salmon sectors.

8.4.5 Correlation between export diversification and industrial policy

In 1973, the Pinochet regime sought to implement a free-market economy by privatizing SOEs and banks, removing all restrictions on FDI and adopted unilaterally an open trade regime characterized by low and uniform import tariffs. However, Chile's so-called uniform tariff has not been so uniform: special protection, inspired by the European Union's Common Agricultural Policy, was offered to some agricultural goods through tariffs that were higher than Chile's so-called uniform tariff since the mid-1980s (Agosin et al., 2010). The government also used the *reintegro simplificado* (abandoned with the Uruguay Round in 2003), which subsidized up to 10% of the value of new exports (Ffrench-Davis and Sáez, 1994). In light of this chapter, it appears that such departures from the free-market agenda were not isolated nor an exception. Indeed, while the Pinochet's government was explicit in stating that the government avoided picking winners by 'letting the market choose' (thereby invoking the logic of the Chicago School), this chapter has outlined the vertical policies towards the forestry, salmon and fruit sectors, that significantly went against sector neutrality. The military regime has

indeed provided plenty of government subsidies for credits in various sectors through organizations such as the Central Bank and CORFO.

Nevertheless, despite the ‘disguised’ use of industrial policy during Pinochet’s military regime, it would be misleading to think that such policy has been a consistent feature of that regime’s economic policy. As argued by Kurtz (2001), Chile can be seen as a case of ‘state developmentalism without a developmental state’. The military regime’s shock therapy in the mid-1970s sent the country spiralling into a financial crisis within few years of its implementation. The regime eliminated price controls, unified the exchange rate, cut public expenditures by half, sold off several hundred state-owned firms, and dramatically reduced import tariffs from 90% to 10% within four years. There was little room for the market to adjust gradually to the strong impact of this rapid liberalization, which led to a rapid increase in non-traditional imports, particularly non-food consumer goods. As a result, per capita imports other than equipment and machinery grew by 115% even though per capita GDP barely increased by 10% in 1970-81. In that period, imports of equipment and machinery as a share of GDP were significantly below the 1970 level, which was insufficient to raise productive investment and recover the 1960s growth rates (French-Davis, 2002). French Davis (ibid.) thus concludes that the expansion of imports (or import de-substitution) was much larger and stronger than export dynamism and specialization, with non resource-based exports ceasing to grow in 1980 generating a growing trade deficit. Pinochet’s neoliberal policies were also followed by very volatile growth and Chile experienced two big recessions, in 1975 and 1982–83, with GDP declining by 13% in 1975 and more than 16% in 1982–83 (Solimano, 2012).¹⁸⁷

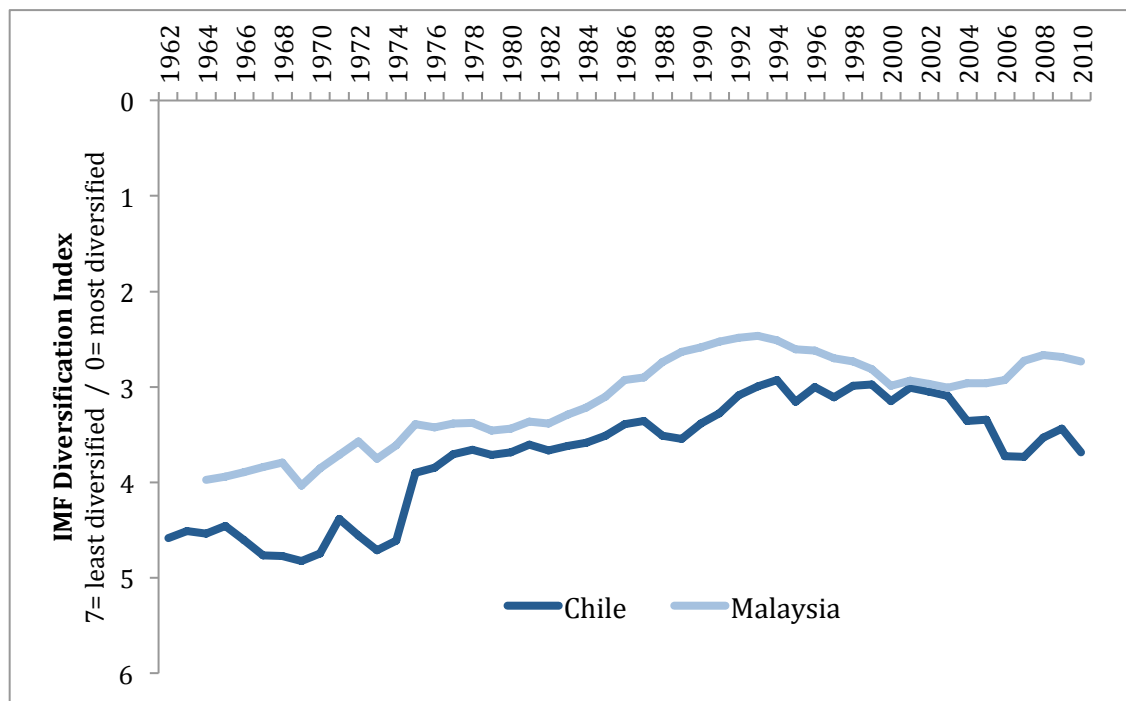
As a result, it is doubtful whether industrial policy was part of Pinochet’s economic project from the start. However, based on the chronology and sequencing of liberal and industrial policies during the military regime, we can reasonably assume that some of the industrial policies emerged as a consequence of the realities of the crisis that were created by the abrupt liberalization of the economy. It can thus be suspected that some of the

¹⁸⁷ French-Davis (2002) argues that even though trade liberalization was required after the excessive effective protection in 1973, the way in which trade liberalization was conducted was excessive, ill-timed, and uncoordinated with exchange rate and capital account policies.

push towards more interventionism might have been driven by the limitations of neoliberal policies in promoting export diversification right after 1973.

Interestingly, the progressive abandonment of those vertical policy tools from the 1990s onwards is correlated to the country's decreasing degree of export diversification (see figure 34). Following the return to democracy in 1990, the new political economy has been much more based on neoliberal fundamentals with a policy consensus that economic growth is based on ensuring macroeconomic stability (low inflation, low fiscal deficits, and moderate current account deficits) and an underlying view that industrial policy was unnecessary or unproductive (Solimano, 2012).

Figure 34: Evolution of Export Diversification in Chile and Malaysia (1964-2010)



Source: International Monetary Fund (2018c)

While long term diversification in Chile shows positive trends with the emergence of niche industries such as salmon, forestry, fruits and wine, the shorter time horizon since 2004 reveals that Chile's export basket has become less and less diversified from 2004 onwards. Varas (2012:16) notes that while policies implemented in the 1990s aimed at correcting market failures by fostering entrepreneurship and innovation, facilitating access to capital, and lowering barriers to export markets, it appears that out of a total of

7,520 exporting companies in 2009, the ten largest exporters accounted nearly half of all export values, with eight of these those firms operating in the mining sector while the other two operated in the forestry sector. Since both of those sectors had strongly benefited from clear state support and vertical policies since the 1970s, it is appropriate to ask whether the neoliberal policies implemented since the 1990s contributed to achieve the goal of diversifying the Chilean economy. This trend could be explained by the fivefold increase in copper prices between 2003 and 2011 as well as China's economic boom, leading to a surge in commodity demand. While Chile's slower diversification is sometimes attributed to a Dutch disease affecting the export capacity of the country, it cannot be attributed to such phenomenon in its strict sense, as there were no exchange rate depreciation between 2004 and the 2009 financial crisis. Perhaps Chile's case supports rentier state theories, according to which high copper prices have hindered incentives to move towards more sophisticated sectors. The lack of diversification could also be attributed to the decades of neoliberal policy with shy sector specific incentives (Official from the superintendence of banks and financial institutions of Chile, personal communication, 2017).

The recognition that sector neutrality has not been enough to achieve economic diversification has led the first Bachelet government (2006-2010) to target specific sectors through a clusters strategy.¹⁸⁸ In fact, the first Bachelet administration, attempted to use vertical policy tools to effectively govern the market in what could be identified as industrial policy 'in disguise': "We don't use the name industrial policy, but what we do is close to that. We just call it 'facilitation' or "networking" (Chilean government official,

¹⁸⁸ The National Council on Innovation for Competitiveness, set up by President Bachelet at the beginning of her mandate in 2006, had first embraced selectivity when it released two "White Papers" in 2007 and 2008, using a study awarded to Boston Consulting Group identifying clusters that productive development policies should target. CORFO also set up High Technology investment promotion programme. According to Agosin et al. (2010), this programme was developed as a direct consequence of Chile's failure to land the Intel semiconductor plant. This programme involves explicit up-front subsidies for FDI in high technology sectors. It thus has a clear vertical orientation (Nelson, 2007). The results so far have been quite promising, with recorded exports of the promoted firms increasing to over USD168 million, while resources allocated to the programme remain modest, especially in comparison with other countries such as Ireland (Agosin et al. 2010; Belmar et al., 2004).

personal communication, July 2017).¹⁸⁹ However, the first Piñera government (2010-2014) embraced sector neutrality and scaled down the clusters programme. According to Juan-Andres Fontaine, the Minister of Economy who was serving in Piñera's government at that time, the decision to scale down the clusters programme was justified by principles of letting the market choose which sectors are strategic and which sectors require public inputs (Personal communication, July 2017).¹⁹⁰

8.5 CONCLUDING REMARKS

The findings of this research show that, in contrast to the laissez-faire narrative, the role of the Chilean state has been crucial in catalysing human capital accumulation, ensuring sustainability, and diffusing expertise and technology in non-copper related sectors, through different types of vertical policies and through various public institutions (government agencies, the Central Bank, Fundación Chile, universities, etc.).

The opening up of the economy in the 1980s subsequently took advantage of the specialized human capital, knowledge and technological capabilities accumulated through vertical interventions prior to liberalization. This finding also confirms the argument in Kurtz (2001) that much of the gain in output recorded in the mid-1970s reflects the public investments made before the coup. While it can be argued that some sectors such as the wine industry could have developed through market forces only, it is undeniable that other sectors would not have developed to the same extent without vertical interventions (in fact, some would not have developed at all given that the policy-

¹⁸⁹ The Chilean government has been recently re-attempting to send market signals to promote new exports: "Is the government trying to send market signals towards certain sectors? Yes, we try to send market signals that we see potential in a sector and that we will support investments in that sector, but we also send market signals through public goods provision. For example, in agriculture, we seen potential and market opportunity for the farming of 'Chilean sea bass' but there is no technology for harvesting it as it appears to be too risky for private investors, so the government sees funding for R&D as public goods provision" (Official from the Ministry of Economy, Personal Communication, July 2017).

¹⁹⁰ This decision also affected FCh, whose budget was cut in half because public funding for innovation was scaled down based on the view that those programmes were the responsibility of private actors (Patricio Meller, president of FCh, Personal communication, July 2017). As a result, FCh's mandate has evolved towards solving market bottlenecks and coordinating prospective studies rather than creating firms.

induced forestry and salmon endowment). The comparative advantage Chile developed in salmon, forestry and fruit production did not only rely on natural factors alone but has instead mostly been *acquired* through technology upgrading, human capital accumulation, export quality control, and financial incentives, through state interventions. For instance, while Chile had had a fishing industry for a century, and while salmon cultivation relies on several natural comparative advantages (such as the availability of adequate protected freshwater and seawater sites far from population centres, adequate temperature, location in the southern hemisphere achieving greater production in the summer than the northern hemisphere), the salmon industry only took off and was scaled up after considerable policy interventions to develop the conditions allowing for its emergence (such as sanitary control of the import of eggs, investments in R&D, technology transfer, training programmes, etc).

In addition, while the wine sector's technological upgrading is mostly the result of foreign investments and horizontal policies (unlike the other sectors analysed in this chapter) it is worth noting that those foreign investments have targeted an industry in which Chile was already a producer, and consequently did not promote a new product beyond Chile's existing productive structures at the time. Hence, while it is a successful instance of 'export discovery', it is not a case of 'product discovery', as in the cases of the salmon or fruit sectors.

The Chilean government has thus relied on several policy tools to effectively govern the market in what could be identified as industrial policy 'in disguise', especially during the seemingly economically liberal military regime (1973-90). However, even though Chile has diversified into different sectors, its productive structures remained confined to commodity sectors. Since the return to democracy in particular, economic policy has focused on natural comparative advantages (at the expense of acquired comparative advantages), which attribute more importance to natural resource endowment than the potential for capabilities accumulation, learning by doing and incremental innovation in new industrial sectors. Such focus is based on the idea by orthodox economists that export orientation is more beneficial than import substitution, because exporting respects the law of comparative advantage. Static approaches to comparative advantage have often

considered agriculture and raw material processing as the developing world's comparative advantage, as almost 90% of third world exports derived from primary products in the 1960s (Amsden, 2008). Chile's focus on natural resource-based sectors is justified by arguments such as the following: "With a relatively small population of just 16 million, Chile's market is certainly limited in its ability to offers firms scale economies in serving domestic demand. With no regional market of the significance of NAFTA or the EU, Chile is clearly too small to attract industries such as auto-assembly, computer manufacturing or biotech research." (Grosse, 2009:171). Such line of argument also emphasizes the failed import substituting manufacturing sectors in Chile in 1960s, such as the automobile sector (Amsden, 2008).¹⁹¹

However, such arguments rely on several assumptions that can be debunked, especially given the fact that Chile had in fact been targeted by Intel to host its Latin American computer and electronics manufacturing operations. The Latin American market also remains an important consumer market. Furthermore, the geographic distance to consumer markets does not seem to have discouraged fresh fruits and fresh salmon exports to East Asia. In fact, if anything, distance to consumer markets is more a reason to promote exports of manufactured goods rather than perishable foodstuffs. In addition, as opposed to the conventional thinking, many of the state-owned and import substitution industries in the 1960s proved profitable (Agosin et al. 2010). Lastly, and most importantly, it can be argued that even Chile's comparative advantages in new primary sectors were dynamically acquired, as opposed to 'revealed' through free market forces thanks to natural endowment factors solely.

¹⁹¹ Thanks to government incentives, Chile, a country with less than ten million people in the 1960s, attracted around 20 automobile assemblers, each operating on a very small scale. Even though the government considered restricting entry to only a few firms, it did not know what criterion to use and there was no weeding out process by the market, leaving one or two players to compete. As a result, Chile's automobile industry collapsed very quickly (Amsden, 2008:105).

Chapter 9

Malaysia's horizontal diversification: a tale of two sectors

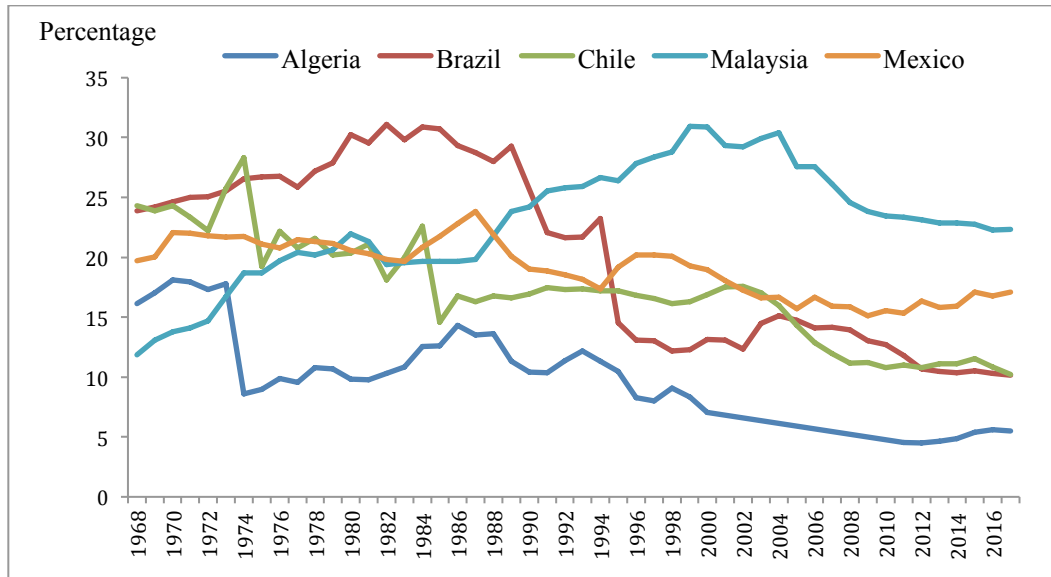
9.1 OVERVIEW

While chapter 7 has highlighted the role of the Malaysian state in promoting vertical diversification around natural resources as part of the country's development, the purpose of this chapter is to examine the role played by industrial policy in stimulating horizontal diversification towards new "unrelated" industries.

Since gaining independence in 1957, the economic structure of Malaysia has changed significantly. At independence, Malaysia's economic activity was dominated by unprocessed primary commodities, which accounted for nearly half of GDP and 80% of exports, while the manufacturing sector represented less 10% of GDP and 5% of exports. Forty years later, the share of manufacturing rose to 30% of GDP and 80% of total exports (see Figure 1 in chapter 1). Malaysia became the developing world's sixth largest exporter of manufactures by the early 1990s (Lall, 1995).¹⁹² Malaysia's manufacturing value added (MVA) as a share of GDP increased also from 13% in 1969 to 31% in 2000, before dropping to 22% in 2017 (see figure 35). The key questions that remain are: What have been the sources of manufacturing growth in Malaysia? Were they caused by market forces in which the government played no particular role? Could they have been even better without intervention? Was there an element of luck?

¹⁹² Meanwhile the contribution of agriculture to GDP dropped from 40% in 1960 to 8 % in 2017 and from over 50% to 2% of exports in the same time period. A similar pattern is witnessed in terms of composition of employment. The share of agricultural employment in total employment continuously declined since independence, and stood at 11% in 2012 while the share of manufacturing employment in total employment reached 29% in 2012 (Siew Yean, 2015). Malaysia's services sector is the largest contributor to GDP and employment.

Figure 35: Evolution of manufacturing value added as share of GDP in selected developing countries.



Source: World Development Indicators, 2018.

This chapter aims to assess the role of government initiatives in the promotion of the electrical-electronics (E&E) and the automotive industries. The E&E industry was selected because it has been the most important contributor to Malaysia's export basket since the late 1980s. A common argument is that Malaysia's diversification towards the electronics sectors was the fruit of free market policies.¹⁹³ In contrast, this chapter will show that several policies towards the E&E sector have departed from sector neutrality. The automobile sector features a different story because it has failed to take off despite being a key area for government support over the past four decades. Using these two sectors as case studies, this chapter examines the formulation and the implementation of key industrial policies and assesses their successes and failures. Such exercise is important, as it informs debates on the scope of state intervention to promote horizontal diversification towards sectors that are unrelated to commodities.¹⁹⁴

¹⁹³ For instance, Nordas et al. (2003) argue that Malaysia's rapid industrialization during the period 1960-99 was the result of low-cost, reasonably productive labor, competitive exchange rates and an open and export-oriented trade and industrial policies, and skills improvement.

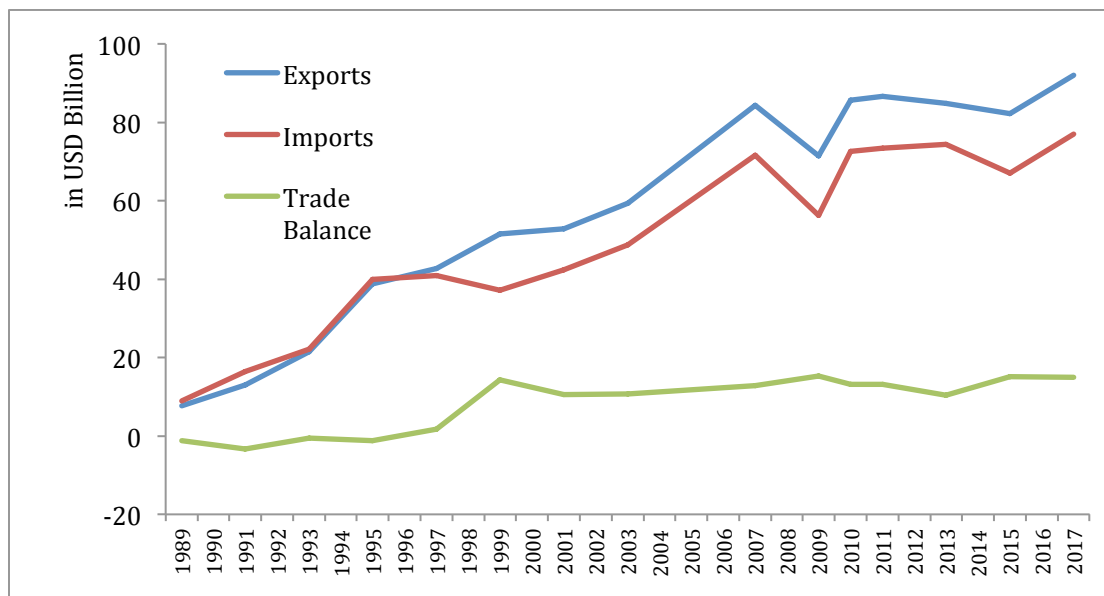
¹⁹⁴ See appendix B for a historical review of different phases of industrial policy in Malaysia since independence.

9.2 THE ELECTRONICS AND ELECTRICAL SECTOR

9.2.1 Overview and performance of the sector

In 2017, the E&E exports exceeded half of Malaysia's total exports with about USD133 billion. However, the electronics sector still relies on labour-intensive specialization rather than technological sophistication. E&E activities in Malaysia have mostly consisted of assembling activities for large MNEs, which is reflected by the sector's stagnant trade balance, despite a large increase in exports (see figure 36 below).

Figure 36: Export, Imports and Trade balance of Malaysia's E&E sector

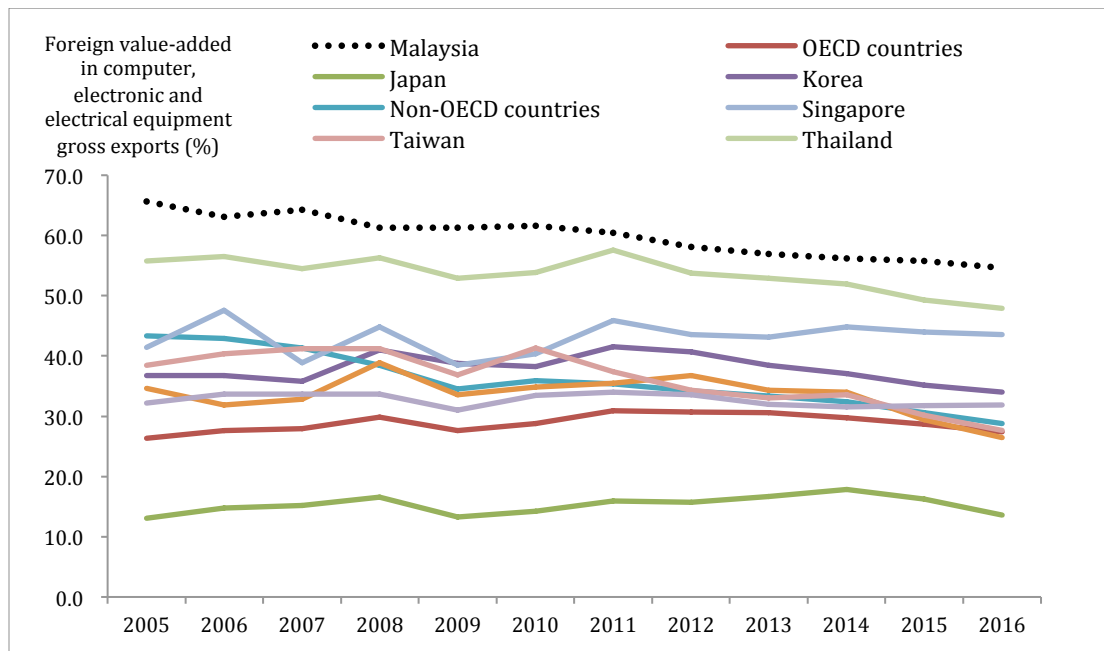


Source: UN Comtrade (2018)

Despite a fall since 2006, foreign value-added continues to represent over half of Malaysia's E&E exports, as shown by figure 37. This is considerably higher than most other East Asian countries and the world average.

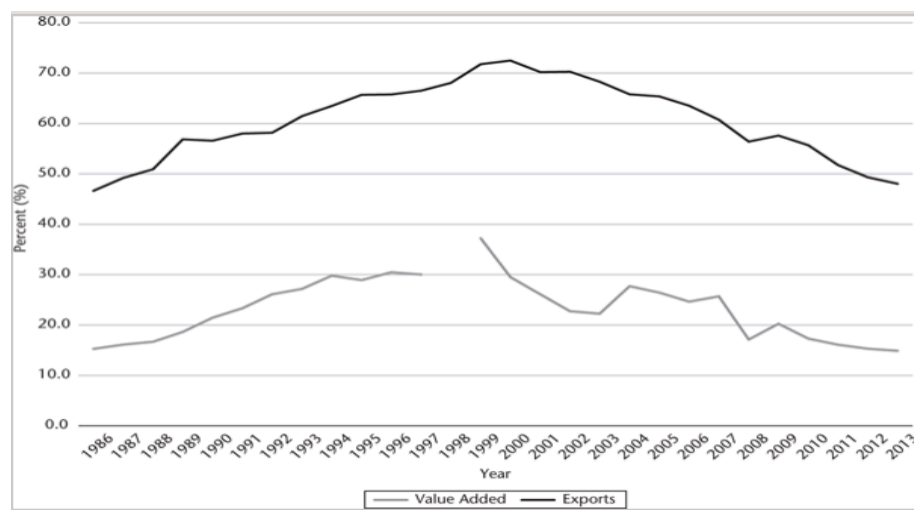
Figure 38 further shows that after reaching a peak in 1999, the E&E sector's shares in manufactured exports and in MVA have been dramatically decreasing. Between 2007 and 2013, Malaysia's share of global high-tech exports (goods and services) have also decreased from 4.6% to 3.5% (Rasiah and Chandran, 2015).

Figure 37: Share of foreign value-added in E&E exports across selected countries



Source: OECD Trade in Value-Added database (2018b)

Figure 38: Contribution of the E&E sector to Manufacturing exports and manufacturing value added in Malaysia



Source: Rasiah (2017)

The contraction of the E&E sector in Malaysia during the 2000s can be partly explained by the relocation of labour-intensive assembling activities from Malaysia to China, Indonesia, Philippines, and Viet Nam, where labour costs are lower. As a result,

employment in the sector, which had steadily increased from the 1970s, has also fallen since 2000 (Rasiah, 2017). In 2016, the sector was employing 322,308 workers (MITI, 2018a). There were around 1,900 firms operating in the E&E sector in Malaysia (IPSOS, 2012), most of which were operating in the segments of the value chains where there is little manufacturing value added. Policy efforts to encourage industrial upgrading may not have sufficed in enabling Malaysia to compete globally at the technological frontier.

9.2.2 How did the E&E sector emerge in Malaysia? Market or state promotion?

Because of the emergence of the E&E sector in Malaysia has been FDI-led, it is often attributed to exogenous factors (such as the appreciation of East Asian currencies in the 1980s following the Plaza Accord and the withdrawal of Korea, Taiwan, Hong Kong, and Singapore from the Generalized System of Preferences). Following the appreciation of the yen (due to the Plaza Accord), Japanese firms relocated some of their operations in South East Asian countries with lower labour costs. Malaysia, because of its relatively educated and English-speaking population, was considered as a prime destination.

However, this story is incomplete. A more complete story, which starts as early as the late 1960s, emphasizes the promotional roles of the provincial state of Penang and the federal government, enabling Malaysia to build a decade of production experience in electronics, which further rendered Malaysia as an attractive FDI destination following the devaluation of east Asian currencies.

Three waves of investments in E&E activities can be identified in Malaysia (Rasiah, 2010). The first wave took place in the early 1970s followed the opening of FTZs in Penang. The second wave took place in the late 1980s, with investments from Japanese firms following the Plaza Accord and a strong appreciation of the yen. While the first two waves targeted labour-intensive assembly operations, the third wave, taking place since 2005, has targeted investments in higher value-added activities such as chip design, wafer fabrication, and supportive R&D activities (Rasiah, 2017).

9.2.2.1 FDI promotion at the provincial level

According to some of the experts interviewed as part of this research, it is the provincial state of Penang that took the initial initiative to promote the E&E industry. According to Wong (2013), because the unemployment rate was much higher in Penang (around 15%) than the national average (of 9%) in the 1960s, the Chief Minister at that time, Dr Lim Cheong Eu was faced with the challenge to create more job opportunities and set up the Penang Development Corporation in 1969 to establish FTZs and attract FDI. Subsequently, Penang's Chief Minister and his team made numerous trips overseas especially to the USA, Europe and Japan to attract MNEs (ibid.). Wong (2013) further provides a detailed account of the leap of faith that Intel's CEO, Andy Grove at the time, took during his visit to Penang, at the invitation of the local government, to set up a factory in the FTZ, which was at the time still a coconut plantation in the process of being readied to be used for factories.¹⁹⁵ This decision marked the start of the E&E industry in Malaysia, and seven other companies (including Hewlett Packard and Hitachi) quickly followed in setting up factories in the Penang (ibid.). Naturally, some of the reasons for the initial FDI inflows relate to low labour costs, availability of good engineers and technicians, and business-friendly policies, but it is clear that the local government also played a role in convincing major MNEs to set up operations in Malaysia.

It is interesting to note that the Penang Master Plan study was commissioned by the federal government in 1970 to provide an alternative development strategy for the region, following the end of Penang's free-port status a year earlier. This report, drafted by an American consulting company, Nathan Associates, became known as the Nathan report, recommended that the state of Penang shifts to an export-oriented strategy focusing on the electronics sector, in light of Penang's limited natural resource endowment and potential (Athukorala, 2014). The Nathan report became the basis of Penang's

¹⁹⁵ The role of the local government in directly approaching Intel stands in stark contrast with the Chilean case. In Chile, it is Intel that approached the government after identifying the country as a potential host for their regional operations. However, the Chilean government refused to pick winners and consequently refused the conditions and incentives requested by Intel.

development throughout the 1970s and 1980s (Goh, 2002).¹⁹⁶

9.2.2.2 FDI promotion at the Federal level

Only few years after independence, the Malaysia government started to promote domestic manufacturing through the Pioneer Industry Ordinance of 1958, based on import substitution considerations. It was during this time that the first E&E firms (such as the Japanese firm Matsushita Electric, now known as Panasonic) started to relocate some of their manufacturing operations to Malaysia (Rasiah, 2017). Following the Investment Incentives Act of 1968 and the Industrial Relations Act in 1967, labour laws were amended and the role of trade unions was weakened to attract MNEs that were seeking to relocate their labour intensive assembly operations to countries endowed with cheaper and skilled labour (ibid.). The Second Malaysia plan (1971-1975) and the creation of free trade zones in 1972, further promoted export-oriented manufacturing, which resulted in an expansion of electronics production in Malaysia (ibid.).¹⁹⁷

The major objective of the government's FDI promotion strategy, through the second Malaysia plan, the NEP and FTZs, was to create jobs. Such objective was confirmed during an interview with Prime Minister Mahathir:

“...From these two sources [tin mining and rubber plantations], we earned our foreign exchange, which was not much. But the problem faced upon independence was creation of jobs. To do that, we opened up land for settlements, but very soon we outgrew our need for land. The next step was to industrialize because industry employs more people than agriculture, but we had no expertise, capital, knowledge of the market and big companies to start these industries. So we invited foreign industrialists to come to invest and create jobs.

¹⁹⁶ In 1962, eight years before the Nathan report, the Penang state government had already engaged a Colombo Plan Advisor to prepare a Master plan for the state. However, the plan was not implemented because it did not have the federal government's support (Goh, 2002). This plan (commonly referred to as the Munro report) was already suggesting that Penang had been granted little priority at the national level, with a threatened free port status, and called for a structural transformation of Penang's economy through import substitution industrialization (Beng and Lee, 2010). Both the Nathan and Munro report were influential in Penang's industrialization, although more emphasis has been placed on the E&E sector in the Nathan report.

¹⁹⁷ As early as the 1970s, the major MNCs (such as Intel, Texas Instruments, Motorola, HP and Siemens) had relocated massive electronics assembly operations in Malaysia (Rasiah, 2017).

We just wanted jobs. We were not interested in taxing them. They had tax holidays for 10 years, to use our labour. That solved most of the unemployment problem [...]. Primarily it [diversification towards new sectors] was about creating jobs for the people. We encouraged whatever industry could employ more people. So initially it was mostly about assembling things [...] but later, we eventually went into the assembly of electronics that were more sophisticated, and we acquired knowledge in that because not really would those industries employs people but need for sophistication and higher technology but better need for trading who will get better wages. If you get better wages better income per capita and GDP will increase. Later, we began [...] to have our own industries for higher and more sophisticated jobs” (Prime Minister Mahathir, Personal Communication, 6th April 2017).

The major role the state played in the emergence of the E&E sector was to develop basic infrastructure, to directly approach potential investors among MNCs from the United States, Japan, and Europe to relocate in Malaysia, as well as to further incentivize them through tax breaks and/or subsidies. As a result, even though external events such as the Plaza Accord of 1985 played a key role in increasing FDI from Japan to Malaysia, Malaysia at that point already had production experience of more than a decade, which was very useful in attracting FDI in the electronics industry (Rasiah, 1988; 2017). By the late 1980s, the government objectives had been achieved, as the electronics industry had become the largest source of manufacturing employment and exports. In Penang, as a result of FDI inflows, the unemployment rate fell from 8.1% in 1971 to 4.0% in 1980 to 2.5% in 1998 (Rasiah, 2017).

9.2.3 Industrial strategy for the E&E sector after 1986

9.2.3.1 Overview

It is also possible to find important interventions by the federal government for the promotion of the E&E sector. A shift of industrial strategy can be noted from the late 1980s, from a relatively horizontal approach (targeting the manufacturing sector, but no particular sector within manufacturing) towards targeted interventions towards the E&E sector, alongside a gradual focus away from the promotion of labour intensive and low value-added assembly activities towards higher value-added activities.

While Malaysia successfully managed to attract MNEs to invest in E&E assembly operations, Rasiah (2017) argues that such policies did not meet the key objective of industrial policy, which is to stimulate structural transformation from low to high value-added activities. In contrast, Singapore had managed to get Hewlett Packard to relocate some aspects of wafer fabrication in the late 1980s, mostly because Malaysia refused to provide capitalization grants upfront (Rasiah 1987; 2017).

However, from the late 1980s onwards, as confirmed during the fieldwork interview with the former and current Prime Minister Mahathir quoted above, the government's objectives for the E&E sector shifted away from the initial emphasis on FDI to create jobs towards higher value addition. Such shift was accompanied by an increased use of targeted policies. Since 1986, in addition to the five-year Malaysia Plans, the Malaysian government launched three Industrial Master Plans and an Economic Transformation Programme that systematically targeted and promoted the E&E sector.

A number of targeted initiatives were launched under the IMP2 in particular.¹⁹⁸ For instance, a special E&E unit within MIDA was created that focused on supporting information dissemination, rapid project approval, advice on factory locations, and liaison with respective state governments for investors (Rasiah, 2017). The government (and more particularly Prime minister Mahathir, under the advice of McKinsey & Company) also launched the Multimedia Super Corridor (MSC) in 1996 in order to provide sophisticated infrastructure in a strategic location to further attract major electronics and multimedia firms. The MSC contributed a cumulative total of RM34.5 billion (around USD10.2 billion) in value added to the country's GDP from 2004 to 2009, generated by around 2520 MSC status companies (64% of which are Malaysian owned) employing 99590 skilled workers (Bin Injau, 2011).^{199 200} Following the launch of the

¹⁹⁸ As noted by Rasiah (2017), despite new government objectives for technological upgrading of the E&E sector, the first Industrial Master Plan (IMP) in 1986 relaxed all pressures on upgrades to avoid scaring away existing firms, following the 1984–5 downturn.

¹⁹⁹ The MSC aimed to develop high technology activities by replicating the Silicon Valley model, attracting FDI from high tech MNCs through tax incentives, infrastructure investment (such as a fiber-optic network), and importing skilled foreign knowledge and ICT workers (Okamoto 2004).

Action Plan for Industrial Technology Development (APITD) in 1991, the government began promoting functional upgrading to stimulate the transformation of the industry to high value-added operations, such as wafer fabrication, chip design, and R&D (ibid.). Several organizations were also created to solve collective action problems in the E&E sector, including the Malaysian Institute of Microelectronics Systems (MIMOS) in 1985 to support the development of national firms. MIMOS incubated several Malaysian E&E firms, such as Silterra, which produces wafers (ibid.).

The initial policy focus on developing domestic capabilities in higher value-added activities led to the emergence of several indigenous E&E firms, such as Carsem, Unisem, and Globetronics (Rasiah, 2017). Some local suppliers have even gone global to supply MNC factories located in other parts of the world such as the Philippines, China and Central America, and many engineers have left MNCs to become entrepreneurs to set up system design companies (Wong, 2013).

However, the objective of technological deepening set from the late 1980s onwards was not fully achieved. The following sections examine more closely the role of fiscal incentives, state venture capitalism, R&D and human capital accumulation in the development of the E&E sector.

9.2.3.2 Targeted Fiscal Incentives

Since the late 1980s, with the launch of the IMP1 (1986-1995), the government promotion of the E&E sector gradually emphasised sophisticated and high-tech activities rather than merely promote the volume of investment and jobs created, as previously done (Best and Rasiah, 2003). The IMP2 called for targeting financial incentives to capital-intensive and strategic industries. However, due to the Asian financial crisis struck in 1997, such policy was not implemented until much later when MIDA established a list of promoted activities products for high technology and strategic

²⁰⁰ Industrial parks, such as the Kulim High Tech Park, were also created in the 1990s to host high technology enterprises.

investments.²⁰¹ Nowadays, several products and activities within the E&E sector remain eligible for fiscal incentives.²⁰²

9.2.3.3 State venture capitalism

The Malaysian government has also invested directly in E&E firms, notably by launching a venture capital firm, the Malaysian Technology Development Corporation (MTDC), in 1992, and by corporatizing MIMOS in 1993. Malaysia's sovereign development fund, Khazanah, has also been increasingly acquiring assets to develop Malaysia's domestic E&E capabilities. For instance, Khazanah opened offices in San Francisco and London to focus on IT sector acquisition and acquire microchip firms. Khazanah has also invested in two domestically owned E&E firms, Silterra (semiconductors) and Amulus (microchips). Silterra, 1st Silicon, Amulus and VLSI are examples of government-owned wafer fabrication firms. Rasiah (2017) argues these state venture capitalism efforts did not yield significant results in the semiconductor industry because Silterra and VLSI are still far from the technology frontier, while 1st Silicon has been since acquired by a foreign firm.

9.2.3.4 R&D and technology transfer

Over the past decades, the Malaysian government has set up different types of financial support schemes for R&D through various organizations such as MITI, MIDA and the Small and Medium Scale Industry Development Corporation.

²⁰¹ The most recent list of promoted activities and products for high technology firms can be found on MIDA's website. Those include design, development and manufacturing of advanced electronics and computing, biotechnology, and the manufacturing of super fine wires, medical and laboratory equipment, amongst other products and activities. High-tech companies must meet several conditions to qualify for the above-mentioned fiscal incentives. Local R&D expenditure should be higher than 1% of gross sales on an annual basis, and the percentage of science and technical graduates should represent at least 7% of the workforce. Investments in the high tech sector deemed of national importance, (defined as investment of more than RM100 million; having backward and forward linkages; and approved R&D facilities) also qualify for full tax exemptions under the Pioneer Status and Investment Tax Allowance (Best and Rasiah, 2003).

²⁰² Those incentives offered by the Malaysian government include Pioneer Status (which involves a tax exemption on 70% of statutory income for five years) and the Investment Tax Allowance.

Most of the government programmes that offer fiscal incentives for R&D have a horizontal scope and do not specifically target the E&E sector.²⁰³ One programme that has a more vertical scope is the Intensification of Research in Priority Areas (IRPA) Fund, created in 1987 under the Ministry of Science, Technology and Environment. IRPA supports the financing of research and development through grants to Malaysian universities and other research organizations. IRPA targets various prioritized and strategic areas, such as design and software technology, nanotechnology and precision engineering. Thematic areas and research directions are defined under the supervision of the National Council for Scientific Research and Development, with consultations with representatives of academia, industry and public authorities (OECD, 2016b).

However, despite the availability of considerable government research grants, the commercialization rate of government-funded research grants remains low, at around 5% of the research output of Malaysian universities (OECD 2011). Academic and public research organizations appear to have a limited ability to translate research into intellectual property rights (Rasiah and Chandran, 2015). This might be due to the weak industry-university linkages (Siew Yean, 2015). According to some account, the lack of industry-relevant research may also be the result of a lack of dedicated intermediary organizations that can match university research with the needs of firms (OECD, 2011; Siew Yean, 2015). However, intermediary organizations do not appear to be lacking in Malaysia given that a wide range of institutions have been created by the government since the 1970s to coordinate technology accumulation and transfer. Those include:

- The Technology Transfer Unit, started in 1975 within MITI.
- The Technology Councils, on which both the public and private sector are represented. Those councils assist firms in moving towards the technological frontier. The leading example is the Penang Industrial Co-ordinating Council. Other councils have suffered from a lack of participation from industrial partners.

²⁰³ Those programmes include the Industrial Technical Assistance Fund; the Technology Acquisition Fund, which helps Malaysian industries obtain strategic technology from foreign sources; the Industry R&D Grant Scheme, which encourages technology adaption and diffusion amongst Malaysian companies; the Commercialisation of R&D Fund, created in 1992 to enhance the commercialization of domestic technology.

- The Malaysian Industry-Government High Technology (MIGHT)
- The recently privatized (in 1992) Malaysian Institute of Microelectronics System (MIMOS). It supports start-ups in the E&E sector, with the assistance of the Malaysian Technology Development Corporation (MTDC), whose task is to identify and financially support promising high-tech firms.²⁰⁴

In 2012, a group of 10 MNEs decided to establish a platform to promote collaborative research among industry, academia and the government to satisfy the research needs of the electrical and electronics industries (Rasiah and Chandran, 2015).²⁰⁵ While foreign firms were already engaged in early stages of R&D since the 1990s, the government was initially favouring national capital over foreign capital in the provision of incentives and grants for R&D following the introduction of the heavy industrialization programme in 1981 and the APITD in 1991.²⁰⁶ The extension of the provision of R&D grants to foreign firms and the approval of permits to import foreign R&D personnel in 2005 has considerably stimulated the undertaking of further R&D activities.²⁰⁷ As a result, the R&D pursued by several MNEs (such as Intel, Hitachi, Motorola, Alterra, Infineon, Onn Semiconductor, etc) has increasingly stimulated upgrading towards higher value-added stages such as chip design, wafer fabrication and R&D (Rasiah, 2017). In fact, foreign multinational firms have been engaging in more sophisticated R&D and product innovation than domestic firms, which have remained limited to basic research (Best and

²⁰⁴ MIMOS contributed 45–50% of Malaysia's patents filed in 2010 but the low citations that have emerged from those patents suggest that the commercialization rate is low (Rasiah and Chandran, 2015). The experience of low commercialization of government-funded R&D in the electronics sector stands in contrast with the high impact and commercialization rates of government funded R&D in the palm oil and rubber sectors for instance.

²⁰⁵ Those MNEs spend nearly RM1.4 billion on R&D annually thanks to government research grants that have been extended beyond domestic firms in 2005 (Rasiah and Chandran, 2015).

²⁰⁶ While studies such as Hobday (1999), and Ariffin and Bell (1999) had found that there has been technological progress within the E&E industry in Malaysia, Pek Chen (1999) found that the technological progress in the semiconductor industry was still structurally weak due to foreign domination, weak linkages between foreign and local firms, low relative technology content in both foreign and local firms, and weak production linkages between suppliers and firms,

²⁰⁷ Nowadays, the government is also encouraging more companies to set up D&D (Design & Development) centres and to set up global procurement centres, regional logistics centres, operational headquarters and other high value operations (Wong, 2013). D&D expenditure has doubled from RM1 billion in 2007 to RM2 billion in 2012 and the number of D&D engineers has almost tripled from about 2,000 in 2007 to 5,500 in 2012 (ibid.).

Rasiah, 2003; Rasiah and Chandran, 2015).²⁰⁸ However, even the R&D conducted by foreign firms tends to be limited to process and product improvements, rather than reaching the technology frontier (Rasiah and Chandran, 2015; Rasiah, 2017). Cherif and Hasanov (2019) also suggest that MNEs have not seriously engaged in technology transfer which is why Malaysia might need to further stimulate the creation of technologies by domestic firms in order to reach the technological frontier and attain the levels of local research and design of South Korea, Singapore or Taiwan.

Wong (2013) suggests that there is a need for supplier development programmes to assist local SMEs to upgrade, grow and compete globally. Such programmes could offer assistance in areas such as technology acquisition, product commercialization, funding, branding and setting up global networks and business connections (ibid.). Marketing and branding are indeed another weakness of local firms (Siew Yean, 2015).

9.2.3.5 Human Capital

Skilled human capital accumulation has remained a major challenge preventing technological upgrading in Malaysia's electronics sector. Both the IMP1 and IMP2 failed to put in place effective human capital development policies to step up the supply of quality engineers and scientists (Cheong, 2011; Rasiah, 2017). Indeed, despite the availability of grants for R&D, several studies have shown that one of the main reasons for the lack of upgrading towards R&D operations in the E&E sector relates to the shortage of specialized human capital (such as quality engineers and scientists) (World Bank, 2009; Wong, 2013; Siew Yean 2015; Rasiah, 2017).²⁰⁹

In addition, most of the labour-intensive operations employ foreign unskilled workers, mostly from neighboring countries. Meanwhile, Malaysia also suffers from a brain drain, which lures skilled workers abroad, especially to neighbouring Singapore (Samel, 2012;

²⁰⁸ In the semiconductor subsector, while 20 of the 21 foreign firms were engaged in at least early stages of R&D, only one of four national firms reported undertaking basic R&D (Rasiah, 2017).

²⁰⁹ Around 40% of Malaysia's firms have identified skill shortages as a top constraint (World Bank 2009; Siew Yean 2015).

Siew Yean 2015).²¹⁰ Because the supply of skilled labour became scarce in Malaysia, the rising demand for statistical and cognitive skills by firms in the E&E sector has led to high degrees of poaching since 1988 (Rasiah, 2017). The lack of human capital and the wage spiral generated as companies headhunted for technicians and engineers (Wong, 2013), is a type of collective action problem.

To solve this collective action problem, the Penang provincial government has initially responded to firms' requests by offering a large building for their use in order to stimulate training for the industry (Rasiah, 2017). However, the most important initiative that has been set up to increase the supply of skilled workers and effectively address the human capital shortage was the non-profit Penang Skill Development Centre (PSDC), created in 1989 through a partnership between the Penang provincial government, the Penang Development Corporation, and several multinational corporations. Sub-committees (which include representatives from MNCs) are responsible for analysing and overseeing training needs; defining the annual programme; and evaluating the effectiveness of courses. By 1998, PSDC had 81 member companies employing 75,000 workers, 40,000 of which had followed courses in PSDC (Best and Rasiah, 2003). However, despite some positive results, the Penang Skill Development Centre has not been able to gain the committed involvement of local universities for long-term solutions to upgrade local capabilities (Piyanit 2010; Siew Yean 2015).

The efforts of the provincial government of Penang to start the PSDC influenced the creation of similar institutions at the national level.²¹¹ The PSDC also influenced the enactment of the HR Development Act in 1992, which aimed to establish a more institutionalized framework to support training at the national level by requiring manufacturing firms employed more than fifty workers to contribute up to 1% of their payroll to the Human Resource Development Fund (HRDF), coordinated by the Human Resource Development Council (Rasiah, 2017). Firms can then claim from their

²¹⁰ The share of migrant workers in the Malaysian E&E sector increased from 1.0% in 1980 to 28.0% in 2007 (Siew Yean, 2015). Meanwhile, roughly 350,000 Malaysians were working abroad in 2008, with over half of them having tertiary education (Fong, 2010; Siew Yean, 2015).

²¹¹ The PSDC was indeed followed by the SHRDC (Selangor Human Resource Development Centre) in 1992 (Wong, 2013).

contributions approved training expenses, which incentivizes them to increase training (Best and Rasiah, 2003; Rasiah, 2017). The HRDF has been instrumental in pushing MNCs such as Intel and Motorola to start their own training centres (Best and Rasiah, 2003). However, indigenous electronics firms are lagging in this respect (ibid.)

The Malaysian government has also responded to the industry's needs by encouraging the creation of more postgraduate programmes in electronics engineering in Malaysian universities (such as Universiti Sains Malaysia). The Northern Corridor Implementation Authority has also set up the Centre of Excellence for Microelectronics, operated by USAINS Infotech, where engineers are trained in microelectronic design (Wong, 2013).

9.2.4 Conclusion

The development of Malaysia's E&E industry features a mixed experience. Only assessing this sector by the size of its exports is somewhat misleading. There is a consensus that most local firms are engaged in the least knowledge-intensive segments of the E&E value chain (Best and Rasiah, 2003; Cherif and Hasanov, 2019; PEMANDU 2010; Rasiah 2012; Siew Yean, 2015; Yusuf and Nabeshima 2009). Despite recent attempts to increase local value-added, the results, although tangible, remained limited.

Initially, the government interventions towards the E&E sector mostly consisted of financial incentives subsidizing infrastructure at FTZs and directly approaching MNCs to attract them to relocate assembling operations in Malaysia. Such interventions were in line with the initial governmental objective for the E&E sector, namely to generate employment and exports. However, the bulk of FDI did not involve high value-added activities. Rasiah (2017) explains, "markets were left to shape firm-level technologies" because of the lack of policy interests for industrial upgrading in between 1970 and the 1990s, and the late introduction of R&D grants.²¹² Because government support was mostly limited to fiscal incentives and basic infrastructure provision at that time, most

²¹² Neither of the IMP1 or the IMP2 included grants or policies to promote R&D not human capital development to increase the supply of quality engineers and scientists, while R&D grants (as part of the APITD in 1991) were delayed to the early 2000s (Rasiah, 2017). MNCs (such as HP and Intel) that considered upgrading into wafer fabrication and chip design in the late 1980s did not do so because of lack of capital grants upfront from the government (Rasiah 1996; 2017).

investments in the E&E targeted labour-intensive activities. Such specialization in labour-intensive activities has been problematic in the long run. Indeed, Malaysia is no longer considered as a low-cost country, leading to a loss in competitiveness in labour intensive assembly, packaging, and testing operations (Best and Rasiah, 2003; Wong, 2013). As a result, several MNCs have already relocated their operations to neighbouring countries with lower labour costs such as Vietnam, Indonesia, China and the Philippines.

From the 1990s onwards, industrial policy objectives for the E&E sector shifted towards industrial upgrading from low value-added to high value-added activities. Fiscal incentives, R&D support and publicly funded human capital accumulation has some positive results. However, despite the availability of R&D grants and notwithstanding the success of the Penang Development Centre and the Penang Skill Development Centre, the lack of a critical mass of human capital and frontier R&D institutions have inhibited industrial upgrading, innovation and the transformation of such firms into global players (Rasiah, 2017). “While ‘carrots’ were given to national firms during the Dr Mahathir regime, the ‘stick’ was never applied. The government’s largely facilitative rather than developmental role has restricted technological upgrading in the industry” (ibid.).

9.3 THE AUTOMOTIVE SECTOR

9.3.1 Overview

Several countries have attempted to develop an automotive industry as part of their industrialization strategies. However, in contrast to countries such as Japan, Thailand or South Korea, Malaysia has not managed to develop a competitive and export-oriented industry.²¹³ How can we explain this divergence of experiences? What have been the strengths and limitations of the Malaysian automotive strategy?

In line with previous assessments on the Malaysian automotive industry (such as Ariffin and Sahid, 2017; Rosli and Kari, 2008; Siew Yean, 2015; Wad and Govindaraju, 2011),

²¹³ In fact, the Japanese firm Toyota has run losses for the first 40 years of its existence, and survived thanks to infant industry protection and subsidies, but subsequently gradually increased its world market shares until becoming a global champion in 2008 (Chang, 2007a).

this section shows that the Malaysian automotive sector expanded in terms of employment, production, sales and local content, but has not managed to become export-oriented due to a lack of competitiveness and industrial upgrading.²¹⁴

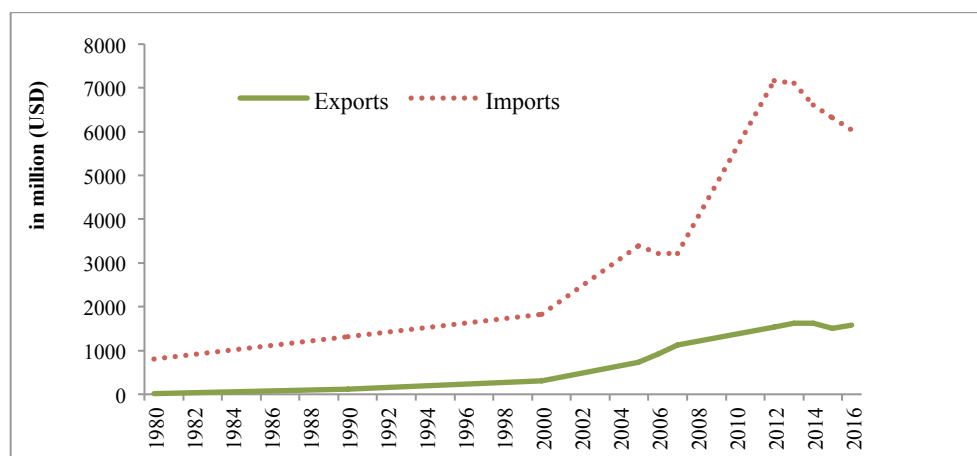
By the end of the 2010s, the automobile industry in Malaysia consisted of 27 manufacturing and assembly plants and 600 automotive component manufacturers (MITI, 2018b). Amongst those components manufacturers, the majority of the firms are still lagging behind in terms of technological capacity and only around 45 firms are exporters, mostly of low-tech components and parts (such as steering wheels, rims, brake pads, wheels, bumpers, radiators and shock absorbers) (Wad and Govindaraju, 2011).

Vehicles sale and production in Malaysia both increased almost fivefold since 1980.²¹⁵ Malaysia's automotive exports even grew more than tenfold between 1990 and 2016 (from USD121 million to USD1.6 billion, as shown in Figure 39). However, the growth of automotive production has stagnated since 2009. More worryingly, Malaysia's automotive exports still only represented around 1.5% of the country's total exports in 2017 (Malaysia Automotive Robotics and IoT Institute, 2019). In addition, figure 39 shows that Malaysian automotive imports have also dramatically increased since the early 2000s, leading to an increasing trade deficit for automotive products. Malaysia's trade deficit for automotive products reached a peak of USD5.6 billion in 2012. Figure 40 furthers shows that Malaysia's automotive production is also far from covering the increasing domestic demand, which explains the reliance on car imports.

²¹⁴ In terms of employment, automotive manufacturing (including assembly activities) generated nearly 60,000 jobs in 2017 (MITI, 2018b). The industry recorded a 3% annual average growth rate of employment since 2000. The two 'national' car-makers Proton and Perodua have the largest share of workforce with nearly 70% of the total employment of motor vehicle manufacturers (Wad and Govindaraju, 2011).

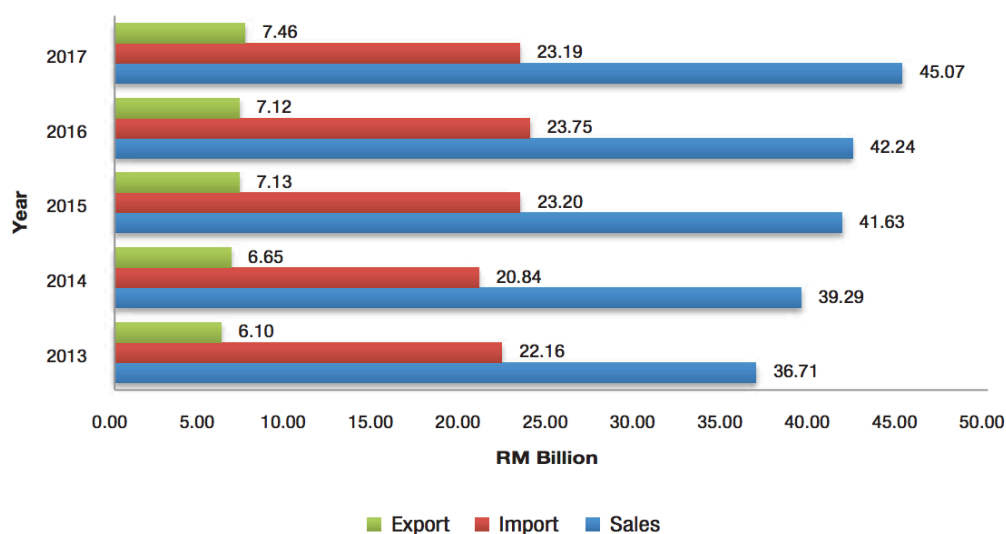
²¹⁵ Vehicle sales went up from around 97,000 in 1980 to 578,000 in 2017, while production of vehicles increased fivefold from around 104,000 in 1980 to about 500,000 in 2017 (MAA, 2018a, 2018b; Wad and Govindaraju, 2011). In 2017, Proton and Perodua, captured 47.8% of the total vehicle market (MAA, 2018b).

Figure 39: Exports and imports of automotive products in Malaysia 1990-2016.²¹⁶



Source: WTO (2018)

Figure 40: Sales, Imports and Exports of Malaysian Vehicle Components and Parts

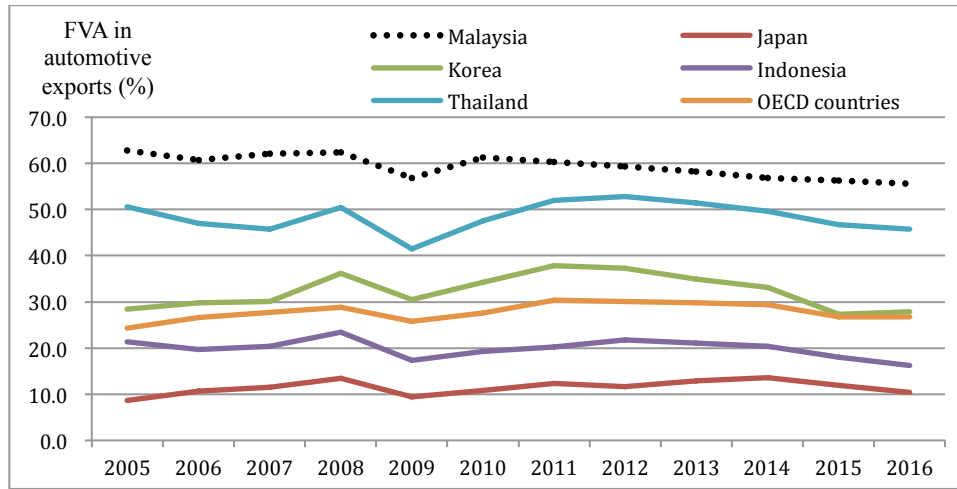


Source: MIDA (2018b)

Despite the reliance on domestically owned car makers, figure 41 shows the share of foreign value-added (FVA) in Malaysia's automotive exports is quite high in comparison to other countries, including Thailand, where the automotive industry is FDI-led.

²¹⁶ Automotive products used for this figure include SITC groups 7132, 7783, 781, 782, 783 and 784 while railway equipment, aircrafts and ships are excluded.

Figure 41: Share of foreign value-added in automotive exports in selected countries



Source: OECD TiVA database (OECD, 2018b)

The next section discusses the role of the state in stimulating the development of the automotive industry in Malaysia before discussing the limitations of Malaysia's automotive strategy.

9.3.2 Role of the State

9.3.2.1 Objectives and motivations

Malaysia's first national car project, PROTON, was approved in 1983 as part of the country's heavy industries programme to deepen industrialization and create Bumiputera entrepreneurs. The government saw the importance to have its own automotive manufacturing industry since the automotive industry was considered (particularly in the pre-globalization era) as the "industry of the industries", due to its potential to drive industrialisation through linkages and spill-over effects on other manufacturing industries (Ariffin and Sahid, 2017; Dicken, 2007; Wad and Govindaraju, 2011).

A fieldwork interview with Prime Minister Mahathir, who initiated the PROTON project, confirms that the motivations behind the promotion of the automotive industry were quite different than the objectives for the electronics industry:

"We promoted the electronics industry because it creates more jobs and better qualified people. In the case of the automobile industry, the aim was to upgrade the national

engineering capacity. As a developing country and former colony, we did not have engineering know-how, so we had to develop engineering capabilities in order to progress. One of the best catalysts for developing engineering capabilities is the automotive industry, because to build a car you need various types of component and parts. If local firms build the components and parts, we will become very skilful in producing engineering products, not only for the automotive but other industries as well. [...] Developed countries have had engineering capabilities that contributed to their growth. We used the car sector in order to accumulate engineering capabilities” (Personal Communication, 7th April 2017).

This emphasis on the transversal linkages arising out of the engineering capabilities that are embedded in the automotive sector contributes to explain why Malaysia chose to build its own automotive manufacturing industry rather than rely on foreign direct investment, in contrast with the E&E sector.

9.3.2.2 State investments to build a ‘national car industry’

The first national automotive project came through with the establishment of the Heavy Industry Corporation of Malaysia (HICOM) in 1981. HICOM is a state-owned enterprise tasked with the development of heavy industries, both on its own and in joint ventures with foreign companies (Siew Yean, 2015). In 1983, HICOM entered a joint venture with the Japanese Mitsubishi Motor Corporation to create Perusahaan Otomobil Nasional (PROTON). After the government invested RM480 million to establish the PROTON automobile factory the first Proton cars rolled out in 1985 (Mahathir, 2011).²¹⁷ In 1993, ten years after the creation of PROTON, the second national car company, PERODUA, was founded. Other national projects followed in the automotive sector. A heavy vehicle company was created in 1994, followed by a motorcycle manufacturer (MODENAS) in 1995, a light vehicle commercial manufacturer (INOKOM) in 1997, and Malaysian Truck and Bus (now Isuzu HICOM after Isuzu took over the majority of shares in 2006) (Wad and Govindaraju, 2011). There are also around ten foreign car assemblers and three composite body sports car manufacturers in the country (Siew Yean, 2015).

²¹⁷ Siew Yean (2015) notes that the total amount spent by the government to set up Proton was much higher as it also included grants to support the development of Bumiputera vendors. Malaysia could afford such expenses to build a national car because of its oil rents.

Proton was originally owned in majority by HICOM, with minority stakes being held by Mitsubishi Group members. By 2005, Mitsubishi had divested their stake in Proton to Khazanah Nasional. By 2007, the largest shareholders in Proton were still government-controlled agencies, namely HICOM, Khazanah Nasional Berhad (42.7%), the Employees Provident Fund (12.6%), and Petronas (9.8%). In 2012, Proton was fully acquired by DRB-HICOM. In 2017, DRB-HICOM sold 49.9% stake in Proton to the Chinese car manufacturer Geely Automobile Holdings. While Malaysian capital has retained the majority ownership of Proton, Perodua is no longer a national car company since its equity was restructured in 2001.²¹⁸

Most of the major domestic auto-manufacturers have thus relied on state investments, notably through the state-owned HICOM and later on through state investment funds, such as Khazanah and PNB. However, some policy changes came about with the National Automotive Policy (NAP), launched in 2006 and reviewed in 2009 and 2014. Through the NAP, the Malaysian government confirmed the previous objective of developing a national automotive industry of original equipment manufacturer (OEM) parts for automotive assembly as envisioned in the early 1980s, but scaled down its ambitions (Wad and Govindaraju, 2011). The Malaysian government has indeed withdrawn from national projects it could not handle by selling its stakes in automotive firms. The overall aim of the NAP is to improve the competitiveness of the automotive industry in Malaysia through technology upgrading and market expansion, notably into the energy-efficient vehicle segment.²¹⁹ However, since the implementation of NAP in 2006, the sales of vehicles in Malaysia have not recorded a significant increase, especially compared to Thailand (Ariffin and Sahid, 2017).²²⁰

²¹⁸ Local investors dominated Perodua's equity until 2001, when Daihatsu, a Toyota subsidiary, and Mitsui, respectively acquired 41% and 10% of Perodua Auto Corporation (Perodua's manufacturing unit) (Siew Yean, 2015). Japanese firms thus effectively control the company.

²¹⁹ Some of the measures outlined in the revision of the NAP in 2014 include the provision of customized incentives to attract strategic investments in the EEV category (MITI, 2018b).

²²⁰ Following the financial crisis in 2009, as part of the 2nd Stimulus Package that totaled RM60 billion, the Automotive Development Fund benefited from a RM200 million grant (equivalent to USD60 million) to develop local vendors and establish the Automotive Institute of Malaysia (Wad and Govindaraju, 2011). While the government's assistance provided cushioning effects to

9.3.2.3 Trade Protection

Several trade protection measures, such as tariffs, imports quotas and restrictions on approved permits for car imports, have been implemented over the past decades to protect the domestic automotive industry.

High tariffs were used to protect Proton from the 1980s until the revisions on import duties as part implementation of the ASEAN Free Trade Area (AFTA) in 2004.²²¹ The first national car, the Proton Saga, launched in 1985, was indeed protected by tariffs ranging from 140% to 300% (Siew Yean, 2015).

Non-tariff barriers, such as import quotas have also been applied on the automotive industry since 1966 (Rosli and Kari, 2008; Siew Yean, 2015).²²² Those measures caused a price difference of 20–30% in favor of the national car over imported cars (Siew Yean, 2015).²²³ Import permits have been increasingly restricted and restrictive. Since 2011, as part of the NAP, approved permits are given only to assemblers whose production of certain models is significant for the export market (ibid.).

The Malaysian government had also temporarily adopted protective measures (such as auto-scrapping schemes) during the global financial crisis by giving rebates of RM5000 for consumers replacing a car more than ten years old with a national brand vehicle (Bursa, 2009, Siew Yean, 2015). In addition, Proton still receives preferential treatment in public procurement and is the official car for civil servants (Siew Yean, 2015).

the auto industry, it did not completely restore the sales level of the pre-2009 period (ibid.).

²²¹ Since 2004, there has been a significant reduction in import duties on all types and variants of CBU and CKD vehicles across regions. However, import duties on ASEAN CKD (0%) and non-ASEAN CKD (10%) have remained.

²²² Import quotas imposed on passenger cars and commercial vehicles have fluctuated between 10% and 1% since 1989 (Rosli and Kari, 2008). Import and excise duties have also been imposed by the government on ‘completely knocked down’ units (CKD) assembled locally.

²²³ For example, Siew Yean (2015) reports that the price of a 1.3 cc PROTON Saga in 1987 was RM21 000, lower than the RM28 000–29 000 of similar imported cars, which allowed PROTON to capture a 65% market share in 1987 and 73% in 1988. This share eventually fell to 25% during 2006–10 due to competition from Perodua, the second national car project, and an increase in imported cars as a result of a proliferation in approved permits (ibid.).

Rosli and Kari (2008) and Rasiah (2005) note that the inclusion of automotives under the common effective preferential tariffs under the AFTA has increased pressure for the removal of localization-based tariff protection for automotive manufacturing. As a result, a key concern should be whether local suppliers are on the path to become competitive once trade protection measures are removed. By comparing the performance levels of local and foreign supplier firms in Malaysia, Rosli and Kari (2008) have shown that local suppliers still lacked technological and managerial capabilities.

9.3.2.4 Tax incentives

Generous tax incentives have been provided to promote investments in automotive manufacturing under the 1986 Promotion of Investment Act (Rosli and Kari, 2008). Amongst those incentives, the Pioneer Status and Investment Tax Allowance are the two most generous tax incentives. They are granted to firms involved in promoted activities or products that are determined by the Ministry of International Trade and Industry (MITI). The automotive sector has been systematically identified in the list of promoted activities by the Malaysian government.

9.3.2.5 Local content policy

In order to localize backward linkages, the government directly intervened in the automotive industry by protecting local suppliers from too much exposure to external competition through local content requirements and fiscal incentives.

In 1979, the Mandatory Deletion Programme banned local car producers from importing 30 automotive parts and components (Alavi and Hasan 2001; Rosli and Kari, 2008; Siew Yean, 2015).²²⁴ In 1992, local automotive manufacturers were required to meet new

²²⁴ The mandatory deleted components comprised 13 items for motorcycles and 30 items for passenger and commercial vehicles (including air filters, batteries, carpets and underlay, coil springs, exhaust systems, fuel tanks, radiators, seats, spark plugs, tyres, wiper motors, and wire harnesses). In 2002, the local items constituted 50% to 80% in the Proton cars, and 35% to 65% in the Perodua cars and other vehicles (MIDA, 2004). The calculation of the reported local content is based on gross value – the percentage would be much lower if the calculation is based on net value due to the fact that most semi-processed materials (such as steel and plastic) to make parts are imported (Rosli and Kari, 2008:107).

minimum local content targets ranging between 45% to 60% of by 1996 (Abdulsomad, 2003).²²⁵ In 2002, following the AFTA, the government had begun phasing out local content requirements with the initial removal of 11 items from the Mandatory Deleted Items List (MDIL). By the end of December 2003, the remaining 19 items contained in the MDIL were removed (Rosli and Kari, 2008).

In the late 1980s, the government also introduced a vendor development programme (VDP). The first VDP was implemented by Proton, and granted financial assistance to Bumiputera vendors (for purchasing capital goods, intermediate inputs, and technology) and enabled them to participate in the Quality Improvement Programme organized by the Standards and Industrial Research Institute of Malaysia.^{226 227}

The local content in Proton cars has reportedly increased since the launch of the VDP, from 18% in 1985 to 80% in 1992 (Abdul Rahman, 1994; Meyanathan and Ismail, 1994).²²⁸ However, Rosli and Kari (2008) found that foreign suppliers still performed better than local suppliers due to their access to superior technology from abroad. In addition, the negative trade balance of automotive part and components also indicates that local suppliers have been unable to meet volume and quality standards, which has encouraged imports (Wad and Govindaraju, 2011). Local suppliers have remained highly dependent on the domestic market and failed to become internationally competitive. The efficiency of local suppliers needs to be raised through appropriate economies of scale by establishing strategic alliances to gain larger market shares (Rosli and Kari, 2008).

One of the reasons for the low competitiveness of Malaysia's auto-parts and components

²²⁵ The variation in local content target was subject to the engine capacity of automobiles.

²²⁶ Perodua undertook a similar vendor development programme since the early 1990s.

²²⁷ Grants could be provided by the Industrial Technical Assistance Fund (ITAF) and through the Proton Technical Assistance Programme, which secured over RM20 million in government grants under the 5th and 6th Malaysia Plans (1986–90 and 1991–85) to help SMEs venture into automotive parts manufacturing (Rali 1999; Rosli and Kari, 2008).

²²⁸ Total vendors of Proton increased from merely 17 in 1985 to 284 in 2005, of which about half are members of the Proton Vendor Association (Rosli and Kari, 2008). About 50% of the suppliers were SMEs and 50% of these SMEs were Bumiputera-owned (Mohd Shah, 1995). In 2004, the total value of components and parts manufactured in Malaysia reached RM5.19 billion, but the import of automotive parts amounted to about RM7.2 billion during the same year (ibid).

industry may also have to do with Malaysia affirmative action agenda. The creation of Proton was a result of the New Economic Policy (NEP), which aimed to create a Bumiputera business community, at the expense of already existing (and dominant) Chinese Malaysian businesses in automotive assembling and distribution (Jomo, 2007; Wad and Govindaraju, 2011). The Malaysian government has therefore bypassed competitive Malaysian Chinese firms in the components and parts industry, which resulted in the neglect of existing production, sales and management experiences (Wad and Govindaraju, 2011; Siew Yean, 2015).

In addition, as pointed out by Wad and Govindaraju (2011), Proton's weak technological, marketing and management capabilities affected the upgrading of its domestic supplier base, because upgrading requires the lead OEM producer to transfer technology, train vendors, and form collaborative production and innovation networks. As a result, Proton partly switched to global first-tier suppliers in the 2000s.

9.3.2.6 Skills development

Unskilled workers represent more than 80% of the workforce in the Malaysian automotive industry (Wad and Govindaraju, 2011).²²⁹ Industrial upgrading requires skills development of the Malaysian workforce. Although domestic automotive manufacturers such as Proton and Perodua undertake skills development programmes and trainings in areas such as production control, welding, painting, trim and final maintenance, tooling, stamping and quality control (Rasiah, 2001; Mahidin and Kanageswary, 2004, Wad and Govindaraju, 2011), the industry still lacks the investment in training and skills development. The training expenditure as a share of sales for manufacturers of motor vehicles and other transport equipment is below 0.10% (Wad and Govindaraju, 2011).²³⁰

²²⁹ Wad and Govindaraju (2011) respectively define skilled, semi-skilled and unskilled workers as degree holders, diploma holders and non-degree and diploma holders out of total workforce.

²³⁰ In comparison, organizations, in the United States spend on average 11% of their budget on training and learning (TrainingMag, 2018).

9.3.2.7 R&D and Technological capabilities

The national auto-manufacturers upgraded technologically to original design manufacturing (ODM) in 2000 and to engine manufacturing in 2002, following Proton's collaboration with and acquisition of the British sports car maker, Lotus.²³¹ However, investments in technology and R&D are still too low with an average of 2% during the 2000-2005 period for OEMs, while other equipment manufacturers only spend around 0.14% (Wad and Govindaraju, 2011).²³² In addition, indigenous technology development in the sector has been inhibited by weak linkages with research organisations, including universities (Rasiah and Chandran, 2015). Such low R&D capacity has hindered local firms' ability to compete internationally, especially given existing high entry barriers and demanding economies of scale in the automotive industry (Siew Yean, 2015; Wad, 2011; Wad and Govindaraju, 2011).²³³

Recent initiatives have been undertaken to stimulate industrial upgrading. In 2006, the IMP3 recommended the creation of a platform for automotive industrialists to come together to formulate strategies in facing the challenges ahead. Four years later, the Malaysian Automotive Institute (MAI) was created under the Ministry of International Trade and Industry (MITI). It functions as a coordination centre and a think tank for the nation's automotive industry and aims to enhance the technology, human capital, supply chain, and marketing capabilities of all automotive stakeholders.

The government has been searching for a partner for PROTON since the Asian financial crisis. In 2017, Proton partnered with the Chinese automaker Geely, who bought almost half of its equity stakes. It is too soon to assess whether this recent partnership will offer more avenues for Proton to upgrade in global value chains.

²³¹ Recent Proton models use Malaysian developed engines through collaboration with its subsidiary, Lotus (Siew Yean, 2015). Proton acquired Lotus in 1996 and sold 51% of its stakes in Lotus to the Chinese car manufacturer Geely Automobile Holdings in 2017.

²³² Such figures fall short of the average R&D spending as share of sales in the auto-industry (3.9%) (Jusko, 2008).

²³³ In contrast, Thailand is one of six countries housing Toyota's global R&D operations and one of the eight hosting Bridgestone's tire test track (Cheong 2011; Siew Yean, 2015).

9.3.3 *Assessment: why Malaysia did not do better in the automotive sector?*

Since 1980, the Malaysian automotive industry has considerably expanded its production and evolved from assembly activities towards the production of higher value added manufacturing through the local production and design of cars and components.²³⁴ However, beyond the pride of a national car manufacturer ownership and the fact that Proton has managed to stay profitable most of the time (in a protected environment), the industry still lacks competitiveness in international markets. The country remains a net importer of automobiles and automotive components. In addition, PROTON's future looks bleak for two reasons. Firstly, Proton cannot survive without becoming export-oriented due to Malaysia's small domestic market, especially since automobile companies need to sell at least 1 million cars a year to remain profitable (Cheong, 2011; Siew Yean, 2015).²³⁵ Secondly, even if Proton manages to export, there is global excess manufacturing capacity of 20 million units in conventional cars (Fong 2011).

Malaysian automotive makers and suppliers can also expect to face greater competition following pressures for trade liberalization at the bilateral and regional level through FTAs under the AFTA, WTO and with the European Union.²³⁶ Trade liberalization under AFTA represents a challenge for domestic firms (if foreign suppliers become the prime beneficiaries of this expansion) but it can also be an opportunity, if they manage to gain access to this large regional market for car parts (Rosli and Kari, 2008). However, the domestic automotive industry still lacks competitiveness to penetrate international markets due to its low levels of skills, marketing and technological capabilities.

²³⁴ Torri (1991) argued that country typically develop a local automotive industry through the following sequencing: import of CBU units; assembly of imported CKD parts and local manufacturing of automotive components; and local production and design of cars and components. Malaysia has already entered the last stages (Wad and Govindaraju, 2011). However, those categorizations do not suffice to assess the performance of Malaysia's automotive industry, which still suffers from limitations that prevent its export orientation.

²³⁵ Kuchiki (2007) argues that domestic demand in Malaysia does not satisfy the minimum average cost of production essential for cost competitiveness in the global automobile industry.

²³⁶ ASEAN and the Japan–Malaysia agreements have left government procurement untouched. However, it is unlikely to be the case for the potential Trans-Pacific Partnership Agreement and a FTA with the European Union, which are also bound to affect tariffs in the automotive sector given the interests of the parties involved in the Malaysian market (Siew Yean, 2015).

Could Malaysia's automotive industry have done better by adopting an FDI-led strategy from the start? Ariffin and Sahid (2017) compared the Malaysian "independent" (albeit not so independent as argued in the previous paragraph) automotive policy focus on national firms with Thailand's "dependent" automotive strategy that relied on FDI. Thailand's annual car production represents four times Malaysia's production.²³⁷ However, it would be wrong to attribute Malaysia's limitations simply to the ownership base of its industry. Thailand's FDI-led strategy also features weaknesses, such as increased dependence and exposure to global markets fluctuations (Abdulsomad, 1999). During the 2008/9 financial crisis, motor vehicle exporters in Thailand were hit more than domestic market-oriented automakers in Malaysia (Wad, 2010).

In addition, we could also compare Malaysia's experience with that of South Korea, where a successful indigenous automotive industry was also developed through domestic firms as opposed to FDI. In Korea, car manufacturers became highly competitive partly because government support was granted upon performance requirements. In contrast, in Malaysia, export conditions were not imposed and there was no sunset clause for phasing out protection. Indeed, despite the fact the Malaysian government did several things right (such as investing in state-owned automotive firms, imposing trade protection measures, local content requirements, and vendor development programmes) Malaysia's automotive strategy failed to emphasize skills development, R&D and performance requirements.²³⁸

Another reason for the low competitiveness of Malaysia's automotive sector may have to do with the affirmative action agenda. The NEP aimed at improving the economic situation of the *bumiputeras* (indigenous Malays), notably by imposing equity ownership requirements and employment quotas for Bumiputeras.²³⁹ The Malaysian government

²³⁷ During the early development of Thailand's automotive industry, similarly to Malaysia, high tariffs were used to protect the domestic industry. However, the government opened the automotive market and attracted MNEs after realizing that high car prices caused by protectionist measures would limit the domestic demand for cars (Tai and Ku, 2013; Ariffin and Sahid, 2017).

²³⁸ Proton did try to export, but with a flawed strategy that consisted in selling vehicles in the British market under the production cost. However, Proton vehicles were of low quality and lost reputation incurring additional costs in servicing (Siew Yean, 2015).

²³⁹ The economic system inherited from colonial times had been responsible for the failure to produce a racially equitable distribution of the nation's wealth (Gale, 1981). The NEP aimed to

has consequently bypassed competitive Malaysian Chinese firms in the components and parts industry, which resulted in the neglect of existing production, sales and management experiences (Wad and Govindaraju, 2011; Siew Yean, 2015). Mahathir (2007) argues that affirmative action is still necessary because the NEP did not attain its redistribution target given that the Chinese community still hold more than 40% of the country's economic wealth. He further argues that the affirmative action agenda did not hold back growth given that Malaysia has grown much faster than practically all other developing countries despite going through forty years of the NEP. Nevertheless, even if Bumiputera equity participation requirements were relaxed over time, the perception of several experts interviewed as part of this study is that the affirmative action agenda has made Chinese entrepreneurs feel alienated and incentivized to migrate, in particular to neighbouring Singapore (Cheong Kee Cheok, personal communication, march 2017; Dato' Dr Thillainathan, personal communication, March 2017). The redistribution agenda might thus have had an impact on the development of the domestic automotive industry.

In addition, the Malaysian government embarked on nationally controlled joint ventures but it faced a capabilities gap in technology and marketing, which led to the continuing reliance of local firms on foreign technology suppliers (Leutert and Sudhoff, 1999). The domestic automotive industry had indeed been dominated by Japanese car-makers following the disintegration of Proton into production (PROTON) and sales companies (EON) in 1984 (later reintegrated in 2009) and the disintegration of Perodua into a production organisation under Japanese control and a sales organisation under Malaysian control in 2000 (Wad and Govindaraju, 2011).²⁴⁰ The Malaysian-Japanese automobile alliance allowed for the transfer of standard product and process technologies and created production capabilities among workers and administrative employees, but it did not support the creation of international sales, managerial, and organizational capabilities,

eliminate the identification of race with economic functions. Lall (1995) notes that the objectives of Malaysia's industrial policy towards heavy industries was different from Korea because the NEP aimed to address social imbalance rather than gain world market competitiveness. Nevertheless, the economic recessions of the mid-1980s led the Malaysian government to relax some of the ethnic requirements of the NEP (ibid.). While absolute poverty declined from 50% in 1970 to 7.1% in 1990, inter-ethnic income disparity ratios remained sizable (Yusuf, 2007).

²⁴⁰ This strategy went against the international norm of the automobile industry, classified as a producer-driven GVC, where lead firms govern the whole chain (Wad and Govindaraju, 2011).

given that Proton was predominantly managed by Japanese managers and technicians (ibid).²⁴¹ It remains too early to say whether Proton's recent partnership with the Chinese automaker Geely will allow for more technology and knowledge transfer than previously.

9.4 CONCLUSION: A TALE OF TWO SECTORS

Malaysia's experience can inform the theoretical debate about the role of industrial policy in pursuing horizontal diversification. In particular, the domestic E&E and automotive sector can inform discussions on the role of infant industry protection and FDI-led export promotion in the larger perspective of global value chains.

The Malaysian experience with the E&E industry reveals a rather 'minimalist' role of the state that initially mostly provided basic infrastructure, an effective bureaucracy, and FDI promotion, thereby following the market lead towards low-wage labour-intensive activities. While Malaysia successfully developed low value-added labour-intensive FDI-led manufacturing activities, such strategy has not sufficed to stimulate upgrading into higher value-added activities to support rising wages, and technology absorption through the emergence of a critical mass of local suppliers and skilled human capital, in contrast to the experience of Japan, South Korea, and Taiwan in the same industry. While policy initiatives have been adopted since the late 1990s to stimulate upgrading to higher value-added activities, the lack of a critical mass of human capital and frontier R&D institutions continue to inhibit value addition and the innovation potential of local firms.

In contrast to the E&E sector, Malaysia's experience in the automotive sector was based on a more aggressive role of the state. On the one hand, since 1980, the Malaysian automotive industry has considerably expanded its production and evolved from assembly activities towards higher value-added manufacturing while generating large employment. The government's objective for automotive production to drive industrialization through linkages towards other industries has also been achieved to

²⁴¹ An experienced Malay took control of Proton in 1994, but he shortly passed away, throwing Proton into a corporate governance mess, ending with its re-nationalisation in 2000. Proton was thus never under private local ownership as in Japan or Korea (Wad and Govindaraju, 2011).

some extent.²⁴² ²⁴³On the other hand, the industrial policy towards the automotive sector failed to stimulate regional competitiveness and export orientation, in contrast to the E&E sector, which had evolved from ISI orientation towards export-orientation.

It would be misleading to attribute this failure to the *objective* and *nature* of infant industry protection, as the neoclassical scholarship would. Instead we can trace the weaknesses of the Malaysian automotive sector to several misguided features of the *implementation* of infant industry protection. First, Malaysia's automotive strategy failed to incentivize (or require) performance and competitiveness. Unconditional protection is unlikely to stimulate competitiveness. Second, domestic firms enjoyed trade protection and subsidies while there was no sunset clause for phasing out protection. This is not to say that prolonged protection was a wrong policy, because it has handsomely paid off in the long run for Japan and Korea, but it is also true that tariff protection and local content requirements are increasingly difficult to implement under international, regional and bilateral trade agreements. Third, the affirmative action agenda within the automotive local content policy has undermined (or at least, slowed down) competitiveness amongst local suppliers, by neglecting the role and production experience of Chinese entrepreneurs in the capacity building process.

All things considered, if we consider that the main objective of industrial policy is to stimulate domestic industrial and technological upgrading from low to high value-added stages in order to eventually to catch up with global competitors, we can conclude that Malaysia's industrial strategy towards both the E&E and automotive sector has not been fully successful. In such regards, it would appear that Malaysian industrial policy has been much more successful in resource-based industries where it successfully met the objectives of industrial upgrading and international competitiveness.

²⁴² As noted in chapter 7, the automotive sector features backward linkages to a number of resource-based industries (such as rubber-based manufacturing and petrochemical-based plastics).

²⁴³ Interestingly, similarly to the Chilean case, it appears that linkages have been more successfully localized in industries dominated by domestically owned firms (such as the automotive, petroleum, palm oil and rubber industries), in contrast with the FDI-led E&E sector. Such relationship is further discussed in the findings of this thesis.

Chapter 10: Findings

10.1 OVERVIEW

This thesis has examined two specific historical cases to provide a clearer picture of the dynamics that influence economic diversification in natural resource-dependent economies. We can identify a number of important findings, hereby reviewed in this chapter. The broader contribution of this thesis is threefold:

The first important contribution of this thesis is its new ways of conceptualizing and classifying resource-based economies. The MINDEX reveals the multidimensionality of resource abundance and dependence and enables a better identification of the specific developmental extractives-related challenges a country might face at a given time.

Second, this thesis finds that the role of industrial policy goes beyond ‘facilitating’ diversification, as it also *shapes* the direction of diversification. In both country cases, government interventions that successfully promoted new sectors and activities went far beyond simply fixing market failure and instead shaped the productive development and capabilities accumulation processes.

Third, this thesis has enabled to reframe the narrative on the development of Chile and Malaysia by debunking several misconceptions associated with the role of free market forces and the contribution of certain sectors over others. In that perspective, this thesis enabled to identify the ‘good, the bad and the ugly’ in order to explain the strengths and limitations of Chile’s and Malaysia’s growth performance.

More particularly, we can identify the ten main messages that arise from this research:

1. *Harnessing natural resources for development is multi-level process and the types of variables that we choose to measure resource abundance reflect different aspects of the natural resource management chain. The MINDEX indicates whether a country is moving in the right or wrong direction extractive dependence and economic diversification over time.*

2. *Resource-rich countries face various degrees of urgency to diversify. For some countries, financial diversification might be suitable, while others should prioritize domestic investments to stimulate export diversification.*
3. *Different diversification pathways are not mutually exclusive. Instead structural economic diversification should rely on combining these different pathways in order to increase their cumulative effects.*
4. *The role of the state goes beyond 'facilitating' diversification, as it also shapes the direction of diversification and linkage development.*
5. *Linkages do not unfold naturally around commodity sectors due to the existence of considerable market obstacles.*
6. *As a result, industrial policy should defy- rather than conform to- comparative advantage, in order to stimulate economic diversification in resource-dependent economies.*
7. *Historical and institutional factors such as policy planning, regional and ideological influence, and the nature of electoral systems contribute to influence both the intention and the ability of governments in promoting policies that foster or inhibit diversification.*
8. *Decisions to undertake value addition in commodity sectors are also influenced by ownership structures and commodity price fluctuations.*
9. *Both Chile and Malaysia have diversified their economy by doing a lot more than laissez faire. In both countries, industrial policies played a key role in linkage development through R&D support, targeted human capital accumulation, price control mechanisms to manipulate market signals, and in providing opportunities for learning-by-doing.*
10. *In both Chile and Malaysia, resource-based industries have acted as a motor of economic development.*

10.2 CONTRIBUTION TO THEORETICAL DEBATES ON THE ROLE OF INDUSTRIAL POLICY IN THE DIVERSIFICATION PROCESS

The evidence reviewed in the comparative study of this thesis confirms the existence of considerable market obstacles in both horizontal and vertical diversification processes. The role of industrial policy is therefore crucial for the dynamic accumulation of

capabilities (such as technology, human capital, and infrastructure) that enables economies to overcome market obstacles in the emergence of new sectors and activities, both within and outside of commodity value chains.

10.2.1 One thing does not lead to another

In terms of horizontal diversification, there is weak evidence to suggest that market forces alone have been the main engine for guiding investments towards the successful new sectors that have emerged in Chile's and Malaysia's respective export baskets since the 1960s. In contrast, as shown in chapters 9 and 10, and as summarize later in this chapter, in both Malaysia and Chile, the state played a key role in promoting successful 'unrelated' activities by guiding investments and effectively 'governing' the market.

When it comes to vertical diversification, the evidence also contradicts the argument that linkages unfold "naturally" around commodity extraction through market forces alone. Chapters 6 and 7 find that there are considerable market obstacles to linkage development in developing countries, which consequently do not necessarily have competitive advantages in upstream and downstream activities alongside commodity value chains. In addition to the existence of high entry barriers (due to capital- or technology-intensive characteristics of value added activities, and internationally consolidated supply chains, developing countries aiming to develop linkages around their commodities also have to face counter-attacks from incumbent firms. In that sense, the literature on global commodity chains is helpful in explaining the consumer- and producer-driven constraints that limit upgrading efforts within commodity value chains.

For instance, in Chile's copper sector, one of the several barriers to value addition lies in the dependence on Chinese imports through a production-driven governance structure. By pursuing value addition, Chilean firms would jeopardize their access to the Chinese market as a major copper ore importer. Such market obstacle, coupled with a short-term profit maximization behaviour from copper exporters, contributes explain why Chile has not pursued downstream value addition in the copper sector. Such findings stand in contrast with the mainstream explanations that sustain that Chile (despite being a country

with an enormous renewable energy potential) has no comparative advantage in energy-intensive activities, such as copper smelting.

In the palm oil sector in Malaysia, efforts to promote value addition through palm oil refining were met with considerable market barriers that favoured the status quo and discouraged domestic value addition. Some of these barriers were ‘given’, such as Malaysia’s small domestic market, lack of marketing expertise for processed palm oil, long transportation time to the major consumer markets during which the quality of processed palm oil deteriorated, making re-refining necessary (Gopal, 2001). However, some of these barriers were also artificially induced (and constituted counter-attacks from the incumbents), such as the European trade tariff escalation to make sure that refining capacity would remain in the European Economic Community (EEC) and funding by vegetable oil lobbies for environmental campaigns targeting consumers against palm oil. As a result, most neoclassical analyses in the 1970s concluded that palm oil refining was beyond Malaysia’s comparative advantage. However, such static approaches to comparative advantage and the argument that linkages ‘unfold’ through market forces alone do not explain how Malaysian palm oil refiners became able to successfully compete internationally. Instead, we need to turn to this study’s findings on the role of state in stimulating linkage development and export diversification more broadly.

10.2.2 Diversification policy implications: The role of the state beyond fixing market failures

This section summarizes the findings of this thesis regarding the role of industrial policy in shaping the process of productive capabilities accumulation and export diversification more broadly. In particular, it is found that the state has a key role to play:

- a. To catalyse targeted human capital accumulation
- b. To solve collective action problems in knowledge creation through R&D support
- c. To facilitate access of domestic firms to foreign markets
- d. To send market signals through price control mechanisms and venture capitalism
- e. To orient resource revenue management towards achieving export diversification
- f. To stimulate the dynamic *acquisition* of new comparative advantages

10.2.2.1 *Role of the state as a catalyst of human capital accumulation*

Gerschenkron (1962:9) argued that, while ‘backward’ countries were often judged based on cheap labour, the most important factor to consider was the presence of industrial labour that could be utilized in factories rather than on land.²⁴⁴ Five decades later, scholars continue to analyse the link between human capital accumulation and export diversification. Using data on a large panel of countries in the period 1962-2000, Agosin et al (2012) find evidence of a positive effect of human capital accumulation on export diversification. Jetter and Ramirez-Hassan (2015) finds that one of the important positive predictors of export diversification (among 36 possible determinants) are net enrolment in primary education, while secondary and tertiary education are found to be less relevant compared to primary education, suggesting that a larger base of the educational pyramid matters the most for promoting diversification.

In light of these quantitative studies, this study contributes to the discussion on the role of human capital with two main important points regarding the link between human capital and economic diversification, by putting forward evidence from the cases of Chile and Malaysia. This thesis demonstrates that not only the accumulation of skilled human capital is crucial in the emergence of new industrial activities as well as resource-based activities, but that the state also has a key role to play in such process by *shaping* and *aligning* human capital accumulation towards supporting industrial diversification objectives. The Jetter and Ramirez-Hassan (2015) study may thus lead to inadequate policy recommendations of neglecting specialized human capital accumulation, which has been crucial in the development of competitive sectors in both Malaysia and Chile.

The importance of the *orientation* rather than the *size* of human capital is well reflected by the case of the Chilean copper sector. In the upstream industry, a mismatch between the supply and demand for skills has inhibited the participation and innovation potential of suppliers of goods and services. The skills mismatch can be partly explained by the

²⁴⁴ Such industrial labour was considered to be extremely scarce in developing countries and he regarded its creation as the “most difficult and protracted process” in the process of economic development (Gerschenkron, 1962:9).

lack of strategic orientation in the government scholarship programme *BecasChile*. As rightly phrased by a government official, “in Chile, we have human capital, but not in the right places” (personal communication, July 2017).

The need for discipline-based discrimination in tertiary education provision can be explained by Hausmann’s and Rodrik (2006)’s ‘doomed to choose’ argument. The production of a particular good or service requires a set of *specific* inputs, which in turn requires labour with corresponding particular skills (amongst other things). As a result, there is a strong case for government intervention to prioritize the accumulation of human capital in certain areas according to existing and future needs.

Public interventions have indeed played a key role over the past 60 years in providing technical training and university programmes in fields related to the sectors that have successfully emerged in Chile’s export basket. Technical training and programmes were publicly funded and provided in marine sciences, biochemistry, pathology, and issues related to aquaculture production and aquaculture business administration, in fruit and agricultural science; and in forestry engineering.

In Malaysia, public institutions have also played a key role in shaping human capital accumulation processes through the creation of technical institutes and university programmes in disciplines related to value addition in the petroleum, palm oil and rubber sectors. Quite tellingly, the sectors that face considerable shortcomings in both Chile (such as the upstream copper sector) and Malaysia (such as the E&E and automotive sectors) are the ones that were characterized by insufficient public initiatives and funding to promote specialized human capital accumulation.

It thus seems that economic diversification requires a collaborative framework between private and public actors, such as governments, public research units and universities. Such collaboration is necessary to tackle skills mismatches and provide new skills required to shape the dynamic innovation-driven processes taking place around and outside the commodity sectors. When institutions for training specialized personnel are lacking, or when particular skills (or at least the bases for acquiring such skills) are not provided by the public sector, private firms either cannot grow due to the absence of

skilled workers or have to train the necessary personnel in-house, which leads to high non-recoverable costs, if trained employees leave the company.

10.2.2.2 Role of the state for R&D support to stimulate industrial upgrading

As emphasized by a rapidly growing body of literature on national innovation systems (see Andreoni and Chang, 2014; Cimoli, Dosi and Stiglitz, 2009; Lee, 2013; Lee and Malerba, 2017; Lundvall, 2010; Malerba, 2002; Nelson and Winter, 1982; Petrobelli and Staritz, 2017), industrial development and upgrading also requires public institutions that provide R&D support, quality certification, standards setting, incubation, technology transfer and technology diffusion. The need for public interventions in providing those services as public goods is justified given the collective action problem involved in their provisions (Andreoni and Chang, 2014).

In Chile and Malaysia, several institutions have played such a role, both at the sector level and at the nationwide level. Fundación Chile has successfully promoted the salmon and the blueberries sectors through the identification, adaptation and development of technologies and the diffusion and transfer of these technologies through the creation of innovative companies. These companies were subsequently used to generate a demonstration effect. Salmon cultivation in Chile also benefited from extensive government-funded R&D. In the fruit and the forestry sectors (and agriculture sector more broadly), the Chilean government also set up institutions such as the Institute of Agricultural Research (INIA), the Forestry Institute (INFOR), and the technology transfer programme (GTT) to facilitate the adoption and dissemination of local and foreign knowledge and technologies by local producers.

Nevertheless, Chile's record of innovation capability building varies greatly between different sectors. While local firms in the salmon sector have gradually closed the technological gap with frontier capabilities, not a single mining supplier is operating at the knowledge frontier in mining, while the overwhelming majority of mining suppliers still classify as displaying average or low capacity in the use of technology. Chapter 6 notably identified insufficient public resources for R&D as one of the main obstacles inhibiting their growth these local suppliers. While the recently created ICF has become

the main financing mechanism out of copper revenues through which the state funds initiatives for innovation and competitiveness through other government agencies, it can be argued that Chile requires a greater focus on innovation to sustain its economic development. Current resources devoted to innovation programmes and institutions (such as the ICF, Fundación Chile, or the World Class supplier programme) are too modest to achieve the objective of transformation towards knowledge intensive activities.

In Malaysia, several intermediate institutions have played a key role in technological diversification and upgrading in resource based industries.²⁴⁵ The Malaysian Palm Oil Board and the Malaysian Agricultural Research and Development Institute have played a key role to promote technology upgrading in the palm oil sector. The Malaysia Rubber Board (MRB) has fostered product and process innovations in the rubber sector. R&D support by the MRB has also enabled to help domestic firms adapt to changing quality standards in foreign markets. In contrast, the E&E and the automotive sectors have suffered from a lack of investments in R&D. Weak industry-university linkages have hindered the Malaysian E&E sector's transition towards higher value R&D, design and testing activities, while the automotive sector remains characterized by very low investments in R&D as share of total sales. It can be argued that Malaysia's objective to reach a high-income status will depend on the ability of domestic firms to integrate and move up the E&E value chain, and on the productivity of suppliers in the automotive sectors. Despite the availability of R&D grants for firms in the electronics sector, it can be argued that the resources devoted to these efforts may remain insufficient and need to be anchored in a national innovation system aiming to build a critical mass of human capital and R&D institutions, in order to leapfrog to the technological frontier.²⁴⁶

²⁴⁵ The role of intermediate institutions to promote R&D at the sector level has been supported by the Intensification of Research in Priority Areas (IRPA) programme, under the Ministry of Science, Technology and Innovation. IRPA has first been introduced in the fifth Malaysian plan (1986-1990), and is one of the main mechanisms put in place to facilitate funding for R&D in priority areas (as defined by successive Malaysia plans). While the data gathered as part of this thesis suggests that IRPA funding has been helpful in promoting R&D in the palm oil sector, a further study and impact evaluation would be needed to comprehensively assess the efficiency of IRPA funding across sectors and across time.

²⁴⁶ It is worth adding that the limited upgrading in these sectors may be due to the slow learning possibilities that are associated with long-cycle technologies or high entry barriers (Lee, 2013). It

10.2.2.3 *Role of the state for trade promotion, quality control & national branding.*

Access to foreign markets is essential for gaining competitiveness in new products. International trade costs are not only determined by natural or exogenous factors (such as geography or technological advancements in the transport sector) but also by policies to overcome trade barriers (Coniglio et al, 2018). This thesis finds that the role of the state can go beyond “facilitating” trade and can proactively shape access to foreign markets.

Several studies (e.g. Mau, 2016; Sheperd, 2011; Feenstra and Ma, 2014) find a positive correlation between export diversification and trade facilitation (namely the reduction of exports costs).²⁴⁷ Such findings would support the view that free trade agreements have been a driving force in the promotion of export diversification (see Cook and Jones, 2015; Dutt et al, 2013; Parteka and Tamberi, 2013). Other quantitative studies refute such view (e.g. Buono and Lalanne, 2011; Dingemans and Ross, 2012). For instance, Dingemans and Ross (2012) find no evidence on the role of FTAs in promoting export diversification in Latin America and cite the case of Chile where most diversification occurred in the 1970s-80s, before the surge of FTAs signed by this country. This dissertation supports the latter argument.²⁴⁸ The opening of the economy after the 1980s took advantage of the specialized human capital, knowledge and technological capabilities previously accumulated through vertical interventions prior to liberalization. In that sense, it is important to consider the sequencing of trade liberalization. Across both country case studies, trade liberalization has been able to benefit diversification mostly following (rather than preceding) the acquisition of productive capabilities through vertical industrial policies, confirming the logic of the infant industry argument.

is thus important to acknowledge that not all sectors offer similar opportunities for learning and catching up. Lee (2019) notably points out that the issue of choice and specialization is less important at low or lower middle income stage but become becomes critical at upper middle stages where the latecomers are getting close to frontier and increasingly competing with incumbent firms and countries in world markets.

²⁴⁷ Export costs are understood as the costs associated to the shipping of a standardized container and administrative procedures, transportation of goods to relevant seaports, and custom clearance.

²⁴⁸ In Chile, the diversification rate actually reduced after the surge of FTAs signed by the country (not necessarily as consequence of those but rather as the outcome of the scaling down of industrial policy and a surge in copper prices).

When it comes to the opening up to foreign markets for Chilean products, the government has played a key role through diplomatic action in the negotiation of FTAs, sanitary agreements for food exports, as well as the creation of export promotion agencies such as ProChile. The negotiations of sanitary agreements with importing countries were also a key element for the growth of certain Chilean exports, especially food-related products, which are particularly impacted by sanitary and phytosanitary standards. At first, one could consider the state's trade promotion as a provision of a 'public good' of a horizontal nature. However, such trade promotion appears to be very targeted as it focused on foodstuff and benefited existing sectors, at the expense of manufacturing.

The role of the Chilean state in marketing domestic products abroad is similar to the Malaysian case where considerable government efforts were deployed to commercialize processed palm oil (PPO) abroad, in the face of EU tariffs and environmental campaigns against palm oil products. Government-to-government partnerships under so-called barter trade enabled to open up export markets for Malaysian PPO leading to economies of scale stemming from a larger customer base. This case sustains the idea that free markets are not 'free', because they are shaped by government actions (Chang, 2012).

In the rubber sector, various government agencies, such as the Malaysian Rubber Export Promotion Council (MREPC), the Malaysia External Trade Development Corporation (MATRADE) and the Malaysian Rubber Board (MRB), have played in key role in identifying and expanding new export markets for local rubber products.

The role of the Chilean and Malaysian governments in promoting access to foreign markets has also included strong quality control to ensure 'national' reputation.²⁴⁹ The government (through public agencies such as Servicio Agrícola Ganadero, the National Fisheries Service, CORFO, and the Chinquihue Foundation) therefore had a key role to play in increasing the value of wine, fruit and salmon products by tackling such collective

²⁴⁹ In some industries, sectoral reputation appears to be characterized by a collective action problem, because while it is very easy for a few firms to hurt the sector's reputation, it is difficult for few firms to enhance the sector's branding on their own.

action problem through enhanced product quality control.²⁵⁰ Similarly, in Malaysia, the government had to ensure and enforce quality control of health-related latex producers in order to mitigate incidents that could hamper the industry's reputation in foreign markets.

10.2.2.4 Role of the state in modifying market signals through price control mechanisms and state venture capitalism

Some of the most successful industries that have emerged in the export baskets of Chile (such as the forestry and salmon sectors) and Malaysia (such as the refined palm oil, refined petroleum, rubber-based manufacturing, and the E&E sector) have benefited to a large extent from market signals manipulated by the government.

In Malaysia, the government has identified in its successive five-year Malaysia plans priority sectors in which investments are eligible for tax incentives. In some instances, such as the palm oil and petroleum sectors, the government has even gone further in modifying market signals towards value addition by introducing export taxes on crude palm oil and crude petroleum.

In Chile, the central bank artificially controlled market prices in a way that would benefit the development of an industrial ecosystem around the forestry sector. The Central Bank offered subsidized credits for forestry plantations before taking measures to ban the exploitation of forest younger than 18 years old as well as render exports of raw wood and debarked logs a difficult task through regulatory measures. As a result, the supply of raw wood became less export oriented and turned towards the internal market. This measure benefited the domestic cellulose and paper industries, which benefited from lower raw material prices.

The Chilean government has also modified market signals in promising industries that would not develop through market forces alone through FCh, which effectively behaved as a semi-public not-for-profit venture capitalist. This type of interventions can be

²⁵⁰ The diffusion of food safety and quality control technologies in the salmon industry was also promoted by INTESAL, a private institute (created by the Salmon and Trout Producers Association) that applied for funding from public funds.

considered as a mechanism to explore new products and promote nascent infant industries.²⁵¹

10.2.2.5 Findings on the fiscal management of resource revenues for diversification

The academic debate on the management of resource revenues in resource rich countries has been concerned with how much of resource revenues should be invested in financial assets overseas for fiscal stabilization and how much should be invested domestically.

Chapter 4 reframed the resource revenue management debates away from a consumption-centred fiscal stabilization agenda and towards achieving the long-term diversification of productive structures. This thesis consequently contributes to an existing discussion that departs from the conventional policy advice that resource-rich developing countries should save all their resource revenues in financial assets overseas in order to deal with the fiscal instability associated with commodity price fluctuations. The conventional models of resource revenue management, most of which are based on the permanent income hypothesis, are dominated by a short-term emphasis on consumption, fiscal stabilization and market equilibrium at the expense of long term structural change. As a result, such approaches have only addressed the symptoms of the resource curse (vulnerability to commodity price volatility) but not its root cause (productive dependence on commodities). Instead, this thesis suggests a dynamic approach to the trade-offs underlying resource revenue management decisions by showing that how resource revenues need to be managed depends on several factors that are country-specific. The factors that influence the urgency to invest domestically include the existing gap in infrastructure and human capital, the current level of export concentration, as well as the level of resource abundance per capita. The critical issue for public investment in many resource-dependent countries is to sustainably diversify the productive matrix to

²⁵¹ FCh's role can be interpreted as alleviating what could be considered as first mover disadvantages. Even though pioneers can gain significant sales advantages, head start in learning, and reputational advantage, as argued by Schumpeter (1942), they can in some circumstances incur even larger cost disadvantages because firms that follow pioneers can learn from the mistakes and successes of their predecessors, reducing their own investment requirements as well as their risks, potentially leading to a free rider problem (Boulding and Christen, 2001).

generate new sources of foreign exchange instead of statically maximizing rents from existing income streams.

In that perspective, Malaysia is one of a handful of developing countries that got closer to an optimal utilization of resource revenues for investments that had a long-term transformative effect on economic diversification, inter-generational equity, and macroeconomic stability. In Chile, while copper revenues have been successfully used to address short-term fiscal stabilization, such strategy has a high opportunity cost for the accumulation of productive capabilities. These findings contribute to reshape the discourse on resource-based development, which has in recent years emphasized the Norwegian model while neglecting the role of production and export diversification.

10.2.2.6 Conforming to- or defying- comparative advantage?

The findings of this dissertation hold important theoretical implications for comparative advantage and industrial policy. A key debate in development economics has been whether countries should be *complying with* or *defying* their comparative advantages (see Lin and Chang, 2009). This question holds important implications for the extractives-led development agenda because the argument of *conforming* to comparative advantages suggests that low-income countries endowed with extractive resources should continue to focus on- and encourage investment in- this sector (Dietsche, 2018).

However, three points can be made. First, as shown in chapters 3 and 4, some resource-dependent countries need to urgently diversify their productive structure *away* from commodities. As a result, conforming to their comparative advantage is a misleading approach for those countries that need to diversify their economies away from volatile commodities and generate employment outside non-labour intensive extractive sectors.

Second, in line with what has been defined as ‘related diversification’ in chapter 2 and as evidenced in the case of Chile and Malaysia in chapters 6 and 7, rather than simply conforming to comparative advantage, countries can benefit a lot from acquiring transversal productive capabilities that are *transferable* across sectors, in order to promote economic diversification (Dietsche, 2018; Morris et al., 2012).

Third, chapters 6, 7, 8 and 9 of this thesis have proved that the *acquisition* of new comparative advantages in both Chile and Malaysia has benefited to a large extent from government interventions. As a result, this thesis confirms the view that some of the key drivers for current comparative advantage, such as human, institutional and technological capabilities, are policy-induced, even in natural resource-based sectors. Comparative advantages thus reflect policies that underpin factor productivity and institutional arrangements relative to those of other countries (Diestsche, 2018).

The evidence here consequently contradicts neoclassical approaches to comparative advantage, and supports the argument that the emergence of new competitive activities in the context of a diversification strategy should be achieved through comparative advantage-defying behaviour. Even new and revisionist approaches that are rooted in the neoclassical paradigm (such as the “Growth Identification and Facilitation” approach by Lin and Treichel, 2014; the product space by Hausmann et al., 2010; and the model of trade and industrialization in Porter, 1990), which sustain that state intervention should target industries within the country’s comparative advantages, remain too narrow to fully explain and predict the export diversification of both Chile and Malaysia.²⁵²

In contrast to static views of comparative advantage, which are path-dependent upon established capabilities, approaches that take into account the dynamic *acquisition* of comparative advantage through path-*defying* behaviour can greatly enhance our understanding of the key factors behind capabilities accumulation, industrial development and structural productive transformation in resource rich countries.

10.2.3 The influence of domestic ownership on linkage development

The findings on the Malaysian experience appear to confirm the hypothesis by Lee et al. (2018) regarding the importance of separating from foreign-dominated GVCs at middle-income stages. While participation in GVCs has been increasingly prescribed for developing countries to achieve economic growth (Baldwin, 2016), many of these

²⁵² For instance, some of the most successful industries that emerged in Chile’s and Malaysia’s respective export baskets would not have been found in these countries’ “open forest” in 1980, a model developed by Hausmann et al. (2007) (see Agosin et al. 2010).

countries remain stuck in low-value-added activities, which raises doubts on the effectiveness of GVCs as vehicles for upgrading.

In Malaysia, domestic ownership has been a key determinant of industrial upgrading across various sectors. When rubber and palm oil plantations were foreign-owned, there was no interest in value addition. The largely European-controlled plantation companies preferred to export crude palm oil and did not see many gains in relocating their vegetable oil processing facilities in Malaysia. The desire to process palm oil and natural rubber increased when the industry became domestically owned, notably following a hostile takeover of three British palm oil and rubber plantation conglomerates by Malaysian public capital on the London stock exchange in 1981. In addition, in the rubber sector, a large difference in purchasing behaviour can be noted between domestic and foreign firms. Foreign-owned firms have fewer forward and backward linkages to other manufacturers in the Malaysian economy than domestically-owned firms.

In the petroleum sector, the national oil company Petronas has played a key role in promoting production linkages through several initiatives. It is doubtful whether similar value addition results would have been achieved if international oil corporations controlled the sector.²⁵³

In contrast, the E&E sector has been mostly FDI-dominated. Most MNCs targeted assembling and packaging activities rather than value-added activities. The FDI-led strategy (in stark contrast with South Korea where E&E firms were mostly indigenous) and the specialization in low-skilled activities have made Malaysia vulnerable to the process of re-localization towards neighbouring countries with cheaper labour costs. Nevertheless, it should be stressed that ownership was not the only determinant of value addition, because some MNCs did consider upgrading into wafer fabrication and chip design in the late 1980s, although they did not do so because of lack of capital grants upfront from the government.

²⁵³ However, it should be acknowledged that the Malaysian case should not be overgeneralized because even though Petronas has been more successful than other NOCs, there are still many NOCs that are plagued by inefficiencies.

The picture is more complex and nuanced in the automotive sector. The sector has been mostly domestically owned (Malaysian capital has retained the majority ownership of Proton, although Perodua is no longer a national car since its equity was restructured in 2001) and it has developed some backward linkages to local suppliers. However, the automotive industry failed to become competitive and has been plagued by inefficiencies. In addition, the Malaysian automobile industry ended up dominated by the regionalized Japanese keiretsu system as a result of the separation between foreign-owned production units and domestically-owned marketing functions (Wad and Govindaraju, 2011).

In Chile, the effect of ownership on value addition is less clear. Initial value addition efforts in the forestry and wine sector have been mostly FDI-led. In the salmon sector, FCh's efforts have been the most successful, but it should be acknowledged that previous efforts to develop salmon farming had already been attempted (less successfully) by an American and a Japanese firm. In the copper sector, the development of local suppliers was initially clearly related to the ownership of mining companies. In the early stages of mining development, foreign-owned firms had no impact on the technological catching-up among local suppliers. The situation changed with the nationalization wave in the 1970s, which led to incentives and expectations for local suppliers to collaborate with the state-owned firm, Codelco. However, the situation has now been reversed and foreign firms produce two thirds of Chile's overall mining output. Surprisingly, while the two major domestic mining firms feature a managerial risk aversion attitude towards local contractors, the programmes to promote the skills upgrading of local suppliers have been initiated by a foreign firm, BHP Billiton.

10.2.4 Policy environment, historical legacies and institutional norms.

The historical and institutional contexts within which economic development proceeded have differed considerably between Malaysia and Chile. This section highlights some of the key institutional differences in the policy environment of both countries.

Dietsche (2018) identifies four levels of institutions that shape the outcomes of extractive-based development: (1) social embeddedness (tradition, norms, customs); (2) the institutional environment (constitutional rules regarding the management of extractive

resources); (3) governance (how specific rules are set up between companies and governments); and (4) resource allocation. She argues that the impact of policies to enhance the contribution of extractive industries to development is limited when social networks (level 1) are resistant. This thesis would go even further by drawing attention to the interrelatedness of these different dimensions. In addition, external factors appeared to have played an important role in influencing diversification policy design and implementation in Chile and Malaysia. This section devotes particular attention to the role of intellectual influences stemming from colonial legacies and regional trends, and the different approaches to policy planning.

10.2.4.1 Industrial policy planning, implementation and adaptability

In Malaysia, there is a clear diversification policy guided by government plans, such as the five-year Malaysia plans (there are now 11 of them), three industrial master plans (IMPs) since 1985, and the economic transformation plan since 2010, which are set and overseen by state organizations such as the Economic Planning Unit (EPU) and the Performance Management and Delivery Unit (PEMANDU).²⁵⁴ The importance of development planning is justified by Prime Minister Mahathir in the following way:

“Being methodical is the way to achieve success. That is one of the most important lessons we learnt from the Europeans, particularly the British. Method involves a series of pre-determined orderly steps and procedures, planned and laid out so as to achieve a certain objective. The country’s development was being based on five-year plans, which enabled us to link the yearly budgets and give us a definite programme for five years. In addition, we had the long-term perspective of 10 years. The plans could not be segregated or kept apart from each other, but had to be continuous so that each could coincide with the previous one” (Mahathir Mohamad, 2009:4).

²⁵⁴ EPU is responsible for overseeing the progress and delivery of the industrial masters plans and five-year Malaysia Plans. The more recently established PEMANDU under the prime minister’s office in 2009, is tasked with overseeing the delivery of the Government Transformation Programme and the ETP. All government agencies must meet key performance indicators and targets to meet. In the absence of discipline and checks and balances, Malaysia’s and Petronas’ ambitious investment projects (such as the twin towers, and the property developments related to the new administrative capital) could have easily turned into white elephants (Gopal, 2002).

IMPs allow for a continuous review of promoted sectors and activities. Both IMPs and Malaysian plans have indeed enabled some degrees of adaptability of industrial policy and their focus has evolved over time.

In Chile, long-term state planning has not been adopted in a comprehensive manner throughout modern history due to both electoral and ideological reasons (that are further explained in the next section). Some of the obstacles to long-term planning may indeed have to do with the nature of the electoral system in Chile. In Chile, presidents are not allowed to seek consecutive re-election. This rule has important implications for industrial policy (which requires long-term vision) and led to the discontinuation of the industrial policy formulated by the first Bachelet administration (2006-2010) by the first Piñera government (2010-2014). The fear of ‘renewed discontinuation’ led to policy stagnation during the second Bachelet government (2014-2018), as confirmed during interviews with government officials.²⁵⁵

In contrast, in Malaysia, a constitutional monarchy with a democratically elected parliament, there are no limits to the number of mandates that can be held by the prime minister. As a result, Tun Dr Mahathir, who served as Malaysia’s 4th and now 7th prime minister, has governed Malaysia for 23 years (between 1981 and 2003 and since 2018). What is more, up until the general elections that took place in May 2018, the economic regime in Malaysia was complemented by a political system grounded on coalition-building and “consociationalism”, beginning with the Alliance and then the Barisan Nasional, which succeeded in containing overt inter-ethnic strife and therefore maintaining stability (Awang, 1983). There were consequently no radical changes to the development-planning and -implementation institutions.²⁵⁶

²⁵⁵ CNID officials were discussing their current programmes with the opposition parties in to ensure policy continuity in the next presidential term. After facing difficulties finding consensus across the political spectrum, a consensus was reached to target “challenges” instead of sectors.

²⁵⁶ As further noted by Prime Minister Mahathir, it is difficult to conduct industrial policy within the scope of a four-year mandate: “The first year you learn ho to do the job, the second year your start planning, but the third year you already have to start campaigning for reelection in the fourth year, so you have no time to implement your policies. In that sense, I am grateful to have had 22 consecutive years as prime minister.” (Personal communication, April 7th 2017).

10.2.4.2 *Ideological climate: the Chicago school versus the 'East Asian school'.*

Chile is often taken by admirers and critics alike to be the quintessential neoliberal model of development as it was the first country in Latin America to embrace neoliberalism after the 1973 coup against Allende's socialist government. Such policy shift may be explained by the influence of the Chicago Boys, who brought Milton Friedman's free-market economic philosophy to Chile. The country's economic policies in the late 1970s and 1980s are often considered to have been influenced to a large extent by their agenda to avoid picking winners and to scale down the use of vertical industrial policies in order to 'let the market choose'. There is no doubt that the Chicago Boys influenced the trajectory of Chile's diversification policy, up until today. After the return to democracy, the new political economy was still fundamentally based on a neoliberal framework. Indeed, during the past twenty-eight years, the policy consensus in Chile has been that economic growth is based on ensuring macroeconomic stability (low inflation, low fiscal deficits, and moderate current account deficits), with the underlying view that industrial policy was unnecessary or unproductive (Solimano, 2012).²⁵⁷

Nevertheless, their influence should not be overstated. Indeed, there are instances of vertical policies that significantly went against sector neutrality, especially during the seemingly neoliberal military regime. Some degree of manoeuvre was thus possible despite the ideological dominance of the free-market philosophy. In addition, the economic development of Chile was also influenced by the 'California School' (see chapter 9). While Chicago and California philosophies overlapped on the imperative of promoting exports, they had dichotomous visions of the state (Tinsman, 2013: 47).^{258 259}

²⁵⁷ Even the more progressive presidents had maintained the orthodoxy and for instance refrained from stimulating the economy through fiscal injections, preferring to save copper-price windfalls despite sluggish growth and accumulated social needs.

²⁵⁸ While most Chileans who studied in California during the 1960s and 1970s had prepared for careers in the public sector following the government-directed National Fruit Development Plan, Chileans studying in Chicago learned about the disasters of state-led projects and the need to minimize government involvement in economic life (Tinsman, 2013).

²⁵⁹ Another important factor that appears to have shaped the intellectual climate under which economic policies have been conducted in Chile is the Latin American experience of failed import substitution industrialization in the 1960s and 1970s. A large fragment of Chilean

In contrast, in Malaysia, the ‘Look East’ policy implemented by the Mahathir administration from 1981 onwards implied taking Japan and South Korea as economic developmental models (Wad, 1988; Jomo, 1994). Such model involved what can be considered heterodox policies at a time where the ‘Washington Consensus’ prevailed. Goldthorpe (2015) argues that the political economy of Malaysia since independence demonstrates the pragmatism of decision-makers, notably in light of the government’s stance towards the conventional economic wisdom from international institutions, at times accepting their advice and at times rejecting it.

The Asian financial crisis of 1997/8 is a key instance when the Malaysian government did not accept the recommendations from the IMF to devalue the ringgit and implement economic austerity. Instead the government imposed stringent currency controls and pegged the ringgit at a fixed rate against the US dollar:

“The World Bank and IMF gave us advice but we found that not all the advice was good for us. Some we accepted, some we didn’t. We conduct our own policies. For instance, [we received] the advice that currency must be freely marketed. People [...] abused that by manipulating currency sales to make profit for themselves, and we lost money so [...] we do not allow it anymore as we fixed the exchange rate.” (Prime Minister Mahathir, Personal Communication, April 7th 2017)

Malaysia was able to recover from the crisis more rapidly than Indonesia and Thailand, which had followed the IMF prescription (Goldthorpe, 2015). In fact, the IMF later recognized that capital controls are necessary at times. “We survived the currency crisis of 1997/8 because we were unorthodox [...] When people were looking at the West, we decided to look at the East. Now, the great minds of the World Bank and IMF say that Malaysia was right in doing that, but now it is too late for many countries” (Speech by Prime Minister Mahathir, July 16th 2019).

economists seem to oppose state interventions because of the track record of state failures in neighbouring Latin American countries, who fell into debt crises by the late 1980s, and their interpretation of how interventionist industrial policy was a major cause of the crisis. However, attributing Chile’s growth to free market policies relies on a partial interpretation of Chile’s development because Chile’s growth has owed much to high copper prices at that time.

There were other instances of defiance of the conventional wisdom. In the late 1970s, against the advice of international institutions, the Malaysian government began to encourage a shift from crude to refined palm oil exports. In the 1980s, the World Bank (1989) argued that Malaysian leaders were severely overestimating the resources available to undertake large-scale, heavy industrial investments but it did not prevent the Malaysian government from pursuing transformative investments. Meanwhile, Malaysian authorities had also at times closely followed the recommendation from UNIDO to diversify out of natural rubber into palm oil and to diversify the range of rubber-based goods products in Malaysia (Goldthorpe, 2015). The Malaysian government even commissioned UNIDO to prepare the first industrial master plan in 1986, in order to rectify some of the failures in the heavy industry development strategy.

It can be argued that such pragmatism towards the policy advice from international institutions is owed to a large extent to the exposure to the East Asian development model. The geographic proximity the developmental success of NICs such as Japan, South Korea, Taiwan and Singapore, has also helped Malaysian policy makers (and citizens) to relativize their performance and remain mindful of the limitations of their growth model. In contrast, it can be argued that Chile, having grown faster than its neighbours from the 1960s to the late 1990s (but having achieved comparable growth rates to Malaysia), fell into a sort of ‘self satisfaction’, which prevented further efforts towards the accumulation of productive capabilities. Such perception was confirmed in some of the fieldwork interviews conducted as part of this study: “Chile has grown faster than the rest of the Latin American region over the past 50 years, so where is the problem?” (Director of a think tank in Chile, Personal Communication, July 2017). This echoes a point made by Palma (2010) but also nearly a century ago by Ortega y Gasset (1918: 15), who found in Latin America a “... tendency to use reality as a mirror for self-contemplation, rather than as a subject for critical analysis and progress”. He argued that the phenomenon of “self-satisfied individuals” that he witnessed in Latin America was a major obstacle for progress, since “human history is the product of discontent” (ibid.).

10.3 REFRAMING THE NARRATIVE OF ECONOMIC DEVELOPMENT OF CHILE AND MALAYSIA

10.3.1 Malaysia: industrial policy and resource-based industries as engines of growth

The complexity of the Malaysian case lies in its dualism and the heterogeneity of its industrial policy design, implementation and outcomes across sectors and over time. Some sectors have relied on FDI while others have relied on local ownership; some were domestic market-oriented while others were export-oriented; and some are resource-based while others are unrelated to the country's commodity base. The Malaysian case consequently calls for nuanced analyses. In that regards, this study has contributed to two main debates surrounding Malaysia's development.

The first debate relates to the role of state versus market forces in Malaysia's diversification. On the one hand, one explanation for Malaysia's economic success emphasises the country's liberal economic policy, trade openness and FDI inflows, stable macroeconomic setting and improvement in the business environment (e.g. Ang, 2008; Case, 2005); and horizontal interventions undertaken by Malaysia's government, such as free trade zones and improvements in the business environment (OECD 2011). Tordo and Anouti (2013) notably note that Malaysia ranks well on "global competitiveness" indices due to its "efficient and sound financial sector, highly efficient goods market, and a transparent and relatively well-developed tax system". This supposedly market-friendly approach is believed to have enabled the emergence of the E&E sector, while the sectors that relied on state interventions (such as the heavy industries) failed to take off and become competitive (see World Bank, 1993).

On the other hand, several scholars have attributed Malaysia's diversification to deliberate and active industrial policy (e.g. Edwards, 1995; Jomo, 2007; Lall, 1995; Rasiah and Shari, 2001; Siew Yean, 2015; Yusof, 2007; amongst others). According to this view, the government has given the broad direction for development, including

socioeconomic goals, while the private sector has been given a relatively free rein.²⁶⁰ This thesis confirms the latter view in two ways:

First, the evidence suggests that the argument that selective interventions were irrelevant or harmful in Malaysia is unwarranted because, while some of Malaysia's growth has been driven by FDI and market-friendly policies, sector-specific industrial policy have also played in key role in promoting Malaysia's diversification towards globally competitive sectors since the 1970s.

Secondly, this thesis shows that the shortcomings of certain sectors could not have been solved with a more market-oriented approach. Rather than being inherently caused by the principles of government interventions, issues of low value-added in the E&E sector and low competitiveness in heavy industries could in fact have been addressed and solved through better industrial policies. While the E&E sector has lacked strategic government interventions to stimulate industrial upgrading, the automotive industry was plagued by poorly designed and implemented interventions that ignored the role of performance requirement and R&D support. The heavy industry drive should have been designed and implemented differently, but this does not imply the failure of industrial policy *per se* (Lall, 1995). While this thesis generally puts forward the Malaysian experience as a developmental success, it also concludes that improvements in industrial policy design and implementation, rather than a more neoliberal approach, is what would have enabled Malaysia to grow as fast as the East Asian tigers.

This thesis also contributes to the debate concerning the developmental contribution of resource-based sectors versus non-resource sectors. In contrast to reductionist analyses that portray Malaysia as a sole case of unrelated diversification into the E&E sector, this thesis finds that Malaysia's vertical integration in natural resource sectors has been a key

²⁶⁰ As noted by Prime Minister Mahathir himself (2007:5-6): "We used a lot of government authority to regulate the market [...] People talk about liberalization as a means of increasing FDI but [...] it's not because you are liberal, it is because you are efficient. [...] If it were just a matter of lower costs, foreign investors would go to Indonesia and China but they come here because we have shown that we are more efficient, business-friendly and able to provide the services they need. That is more important than being liberal".

engine of growth. Those findings are in line with Perez's (2008) insights on the perspectives of technological development through resource-based development.

10.3.2 Chile: the free market myth

Assessing industrial policies in Chile remains a rather contentious and divisive topic. Chile has had a long and inconsistent historical approach to industrial policy, from heavy reliance on the state to guide industrialization to a free-market approach. One of the most common and enduring myths associated with recent economic development history portrays Chile as a 'free market miracle', a term coined by Milton Friedman. Such dominant view sustains that the successful emergence of new competitive sectors in Chile's export basket are the result of four decades of commitment to economic openness and free market policies, and attributes Chile's growth to the liberalization process during military regime (1973-1990), whose impacts would have come into effect later from the 1990s until today.²⁶¹ Chile is indeed often taken by admirers and critics alike to be the quintessential neoliberal model of development in Latin America, as it was the first country in the region to embrace neoliberalism after the 1973 coup against Allende's socialist government. While "neoclassical" narratives have dominated most accounts of Chile's economic development, several "dissenting" economists and economic historians (such as Manuel Agosin, José Miguel Ahumada, Claudio Bravo-Ortega, Ricardo Ffrench-Davis, Marcus Kurtz, Gabriel Palma, Andres Solimano, amongst others) have produced seminal works that critically analyzed the limits of the neoliberal model in Chile.

Three main findings contribute to debunk the myth of Chile's free market 'miracle':

Firstly, the supposedly free-market oriented military regime was far from genuinely adopting free-market economic philosophy and actually was involved heavily in subsidizing the structural transformation of the Chilean economy. By analysing the dynamics underlying the emergence of new sectors in Chile's export basket, this study

²⁶¹ The Financial Times (2014) saw Chile "as having been a laboratory for free market economics for 30 years". Richard (1997:139) even claims that "Chile's adherence to the classical economic development doctrine based on liberalization and free trade has been [...] so successful in generating high rates of export-led growth that the country's recent economic record has been favourably compared by some to the performance of the four 'Asian tigers'".

has shown that Chile has managed to diversify by doing much more than laissez-faire and leaving the steering wheel to the market's invisible hand. This study thus supports and strengthens the argument made in Agosin et al. (2010), Bravo Ortega and Eterovic (2015), Colfins and Lear (1996), Ffrench-Davis and Sáez (1995), Kurtz (2001) and Schurman (1996).

Secondly, it can be argued that free-market policies have had a detrimental effect on Chile's growth and resulted in the limitations of Chile's development rather than its successes. Several scholars have shown that free-market policies resulted in the financial and balance of payment crisis before the 1982 debt crisis (see Ahumada, 2019; Ffrench-Davis, 1986, 2002; Solimano, 2012), which may explain why the military regime increasingly relied on industrial policies thereafter. In addition, in contrast to the sectors that relied on state interventions, linkage development has been relatively weak in the sectors where the state has adopted a more laissez faire approach, such as the copper sector. This thesis finds that the industrial fabric around Chile's copper is rather weak in comparison to those found in other resource-rich countries such as Australia and Malaysia, both in terms of downstream and upstream value addition.

Lastly, while some of the most successful vertical policy instruments were used during the seemingly economically liberal military regime (1973-1990), it appears that the progressive abandonment of those vertical policy tools from the 1990s onwards (by democratic governments) is correlated to country's decreasing degree of export diversification. In fact, Chile's export basket has experienced increasing concentration from 2004 onwards. As a result, much of Chile's growth since 1990 has owed much to higher copper prices. When copper prices declined between 2014 and 2017, Chile's growth also slowed down, which negatively affected private investment and exports.²⁶² The fact that Chile's recent export concentration has eventually translated into slower economic growth shows that "adhering strictly to macroeconomic fundamentals is not

²⁶² While Chile has been one of Latin America's fastest-growing economies in recent decades, Chile's GDP growth in 2017 dropped to 1.50%, ranking the country only 24th out of 34 Latin American and Caribbean economies.

enough to ensure steady high-end economic growth when sector-specific weaknesses are not addressed” (Solimano, 2012:51).

10.3.3 Comparing the performance of both countries

One of the policy dilemmas in resource-dependent countries is whether to diversify *around* or *away* from domestic resource sectors. In this regard, the two country cases studies offer an interesting comparison. While Malaysia appears to have performed better than Chile in terms of vertical diversification in existing resource sectors (i.e. linkage development around petroleum, palm oil and rubber in Malaysia in comparison to copper in Chile), it appears that Chile has performed better than Malaysia in terms of horizontal diversification towards new globally competitive activities (i.e. salmon, wine, forestry and fruit sectors in Chile in comparison to the E&E and automotive sectors in Malaysia). However, it should also be noted that Chile’s horizontal diversification has remained confined to commodity sectors (relying on a competitive advantage stemming from natural factors). Chile has not ventured into new industrial sectors that go beyond natural resource-based comparative advantage since the 1960s, unlike Malaysia.

It is important to stress that there is no universal diversification strategy that is suitable across all countries. Whether to follow a diversification pathway over another are highly contextual and depend on several factors (such as nature of the resource base, prospects for linkage development, resource abundance per capita, amongst other elements). For countries deciding to turn their resource base into manufactured goods, the experience of Malaysia over the past 50 years may point out at lessons to be learnt. For the one attempting to *acquire* new comparative advantages in resource sectors, the experience of Chile offers valuable lessons.

10.4 LIMITATIONS AND FUTURE AREAS OF RESEARCH

There are important issues that have not been investigated further as part of this research due to theoretical scope and word length limitations. Although they are not the central topic of this thesis, problems such as environmental concerns of resource-based development and the redistributive effects of different diversification strategies should be addressed in future research.

10.4.1 Environmental concerns

Environmental sustainability is certainly an important consideration when it comes to resource-based development, especially if ‘development’ is understood holistically as a process that cuts across political, social, economic and ecological boundaries. This thesis has mentioned environmental sustainability issues in the context of salmon farming in Chile (especially the tragedy of commons that led to the ISA virus). Nevertheless, other relevant environmental issues that could not be further addressed include the increase of deforestation in Malaysia over the past decades partly due to the expansion of palm oil plantations, and the environmental impact of petroleum and copper extraction in Malaysia and Chile, respectively. Those considerations will gain importance in the future, as it can be anticipated that the countries that minimize the environmental costs of their extractive sectors will be those that retain access to the best markets.

The issue of climate change in the context of resource-based development is an interesting area for future investigation. Climate change and resource-based development are bound together in a two-way relationship. On the one hand, resource-based development bears implications for climate change, both in terms of speeding it through CO₂ emissions and mitigating it through the production of raw minerals (such as lithium) that are required for the production of green technologies.²⁶³ On the other hand, climate change also bears important implications for the vulnerability of agricultural commodity-

²⁶³ Minerals and metals are seen as critical for a low-carbon future (World Bank 2017).

dependent countries, and by extension many developing countries.²⁶⁴

By deepening the topic of linkages arising out of commodities, this thesis has also opened new questions for research that relate to renewable energies. In particular, a question that can be raised and further investigated relates to the nature of linkages between extractive sectors and renewable energy sectors. Understanding the transversal linkages between renewable and non-renewable production processes will be central to understanding how hydrocarbon-rich economies can transition towards green energy.

10.4.2 Redistributive effects of different diversification pathways

The distributional consequences of different export diversification strategies are important issues to consider. Chapter 4 examined the distributional consequences of export diversification across a large set of countries. However, it should be acknowledged that this thesis did not examine the reverse causality, which is the impact of inequality on the feasibility and outcomes of different diversification strategies. It can also be anticipated that different sectors feature different outcomes in terms of distributional effects. Manufacturing was at the heart of modern economic growth because it was considered as having the power to create new skills and pay higher wages. Following this premise, it can be argued that Chile, despite its relative export diversification (which would be expected to reduce income inequalities by expanding employment opportunities for different segments of the population), has maintained a highly unequal income distribution due to its economic concentration on raw materials (Amsden, 2008; Kay 2002). In order to fully investigate the main beneficiaries of each diversification pathway, we would need to analyse distributional effects not only at the macro level but also at the sector and firm level (by looking at degree of firm concentration, their ownership structure, labour intensity, workers conditions, land concentration, etc.). Such analysis may require going deeper into each country's history to explain the reproduction of class-based inequalities in industrial and agricultural contexts, notably through systems of

²⁶⁴ See Kahn et al. (2019) for a discussion on the macroeconomic consequences of climate change across countries and sectors.

hacienda and *latifundio* in Chile for instance (See Kay, 1997, 2002; Tinsman, 2013).²⁶⁵

While these topics are not investigated within the scope of this thesis, chapter 9 acknowledges some of the interesting distributional dynamics in the forestry and fruit sector in Chile (particularly in terms of the limited number of firms and their ownership structures). Additionally, this thesis provides an examination of Malaysia's redistribution agenda and its impact on industrial development, given that the NEP was a key feature of the country industrial policy since 1970.

10.4.3 The multidimensional indicator of extractives-based development (MINDEX)

Most of the economic literature on natural resources has used different indicators of resource abundance and resource dependence in isolation from one another. Such approach has often resulted in a conflation between resource abundance and resource dependence, which has led several studies to be misguided by statistical flaws. The diagnostic tool developed in chapter 3 is an effort to go beyond common conceptual flaws and reveal the multidimensionality of resource abundance. Developing and applying this tool faced some challenges of methodological character, including issues of data availability and comparability. Such issues have been addressed through a scoring system and appropriate benchmarks for each indicator. The MINDEX may be the most comprehensive effort so far to capture the multidimensionality of resource abundance in comparison with existing indicators such the Resource Governance Indicator (RGI), the Mining Contribution Index (MCI) or the World Bank's Mining Sector Diagnostic (MSD). Future research will aim to scale up this indicator by expanding the database in collaboration with civil society organizations and international bodies in order to identify patterns across time and across countries.

²⁶⁵ *Haciendas* are large estates or plantations with a dwelling house in the colonies of the Spanish Empire. *Latifundios* are extensive parcels of privately owned land that usually involve the exploitation of peasants or slaves.

10.5 CONCLUDING REMARKS

This thesis contributes to the scholarly effort to move away from natural resource determinism towards acknowledging that natural resources are neither inherently a curse or blessing for development but are instead influenced by state policy actions. More particularly, the ambition of this thesis has been to provide a thorough analysis of the role of industrial policy for export diversification in economies that are dependent on non-renewable resources. This objective has been pursued through both conceptual, statistic and historical analysis of diversification in Chile and Malaysia over the course of the past seventy years. This has been achieved through extensive archival research, and the interviewing of close to one hundred people within the government, civil society, academia and the business sector.

A critical reflection can be drawn on the case studies of this thesis. The cases of Chile and Malaysia are analyzed to disentangle dynamics of economic diversification in natural resource-dependent economies. However, it is worth ending this study by stressing that while many lessons can be learned from these two cases, there is no 'one size fits all' approach when it comes to diversification strategies, which are highly context dependent. Diversification strategies that can be effectively implemented in one context may be much more difficult to implement somewhere else because the political economy of a country plays a crucial role in the developmental process. A country's social, cultural, political factors contribute to influence both the intention and ability of governments in promoting policies that foster or inhibit diversification. This thesis has notably shown that the intellectual climate within which economic development took place differed considerably between Malaysia and Chile due to ideological and historical differences.

Nevertheless, one commonality across countries appears to lie in the fact that economic diversification policy requires pragmatism, boldness and creativity. As observed by Albert Hirschman (1967:13), "Creativity always comes a surprise to us; therefore we can never count on it and we dare not believe in it until it has happened. In other words, we would not consciously engage upon tasks whose success clearly requires that creativity be forthcoming". However, the failure to engage in creative imagination of alternative

realities might inevitably lead to maintaining the status quo. As shown by this thesis, economic diversification precisely comes about through the implementation of the creative vision of what a country ought to be producing and that it does not already produce.

It has indeed become clearer throughout this thesis that neoclassical approaches and static views of comparative advantage, which are path dependent upon established capabilities, are unsuitable in explaining the process of structural change of resource-dependent economies. Indeed, most of the mainstream policy advice to economic diversification in resource rich countries has been dominated by a short-term emphasis on consumption, fiscal stabilization and market equilibrium at the expense of long term structural change. As a result, such approaches have only addressed the symptoms of the resource curse (vulnerability to commodity price volatility) but not its root cause (productive dependence on commodities).

In contrast, approaches that take into account the dynamic *acquisition* of comparative advantage can greatly enhance our understanding of the key factors behind capabilities accumulation, industrial development and structural productive transformation in resource-dependent countries. This thesis found that government interventions that successfully promoted new sectors and activities in previously resource-dependent economies went far beyond simply fixing market failure and instead shaped the productive accumulation of capabilities to promote new activities and sectors, both within and beyond commodity value chains. The role of industrial policy in guiding the export diversification process consequently also stems from the non-market directed nature of the diversification process, and the recognition that the accumulation of capabilities is complex and affected by a country's institutional and structural characteristics.

Bibliography

Academic articles, books, and reports

- Abdul Rahman, A. A. (1994) “Nurturing of Bumiputera SMIs through PROTON’s vendor scheme: a case of trachoma”, in H. Fujio (Ed.) *The Development of Bumiputera Enterprises and Sino-Malay Economic Cooperation in Malaysia*, 19–39. Tokyo: Institute of Developing Economies.
- Abdulsomad, K. (1999). “Promoting industrial and technological development under contrasting industrial policies: the automotive industry in Malaysia and Thailand”, in Jomo, K.S., Felker, G. and Rasiah, R. (Eds.), *Industrial Technology Development in Malaysia: Industry and Firm Studies*, New York :Routledge.
- Abdulsomad, K. (2003). “Building Technological Capabilities of Local Auto Parts Firms under Contrasting Industrial Policies: A Comparative Study of Malaysia and Thailand 1960 – 2000”, *Lund Studies in Economic History*, 27. Stockholm: Almqvist & Wiksell International.
- Abidin, M.Z. (2001). “Competitive Industrialization with Natural Resource Abundance: Malaysia,” in Richard M. Auty (ed.), *Resource Abundance and Economic Development*, Oxford: Oxford University Press.
- Acemoglu, D. & Robinson J.A. (2012). *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*. New York: Crown.
- Achurra, M. (1995). “La Experiencia de un Nuevo Producto de Exportacion: Los Salmones’ [The experience of a new exported product: Salmon], in P. Meller and R.E. Saez (eds) *Auge Exportador Chileno: Lecciones y Desafios Futuros [Chile’s export boom: lessons and future challenges]*, 43–71. Santiago: Cieplan
- Addison, T. (2009) “The Political Economy of the Transition from Authoritarianism”, in De Greiff, P., & Duthie, R. (Eds.). *Transitional justice and development: making connections*. 110-141. New York: Social Science Research Council.
- Addison, T. & Roe, A.R. (2018). *Extractive Industries: The Management of Resources as a Driver of Sustainable Development*, WIDER Studies in Development Economics. Oxford: Oxford University Press.
- African Development Bank (2017). *Chile’s fiscal policy and mining revenue: a case study*. Retrieved from: https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/anrc/CHILE_CASESTUDY_ENG_HR_PAGES.pdf [Accessed 31 march 2018]

- Agosin, M. (1998). "Capital inflows and investment performance: Chile in the 1990s", in R. French-Davis, H. Reisen (1998), *Capital Flows and Investment Performance: Lessons from Latin America*, Paris: OECD.
- Agosin M. (2009). "Export Diversification and Growth in Emerging Economies", *CEPAL Review*, 97, 115–31.
- Agosin, M. R., & Bravo-Ortega, C. (2009). "The emergence of new successful export activities in Latin America: The case of Chile", *IDB Working Paper No. 236*. Washington, DC: Inter-American Development Bank
- Agosin, M., Larraín C., Grau N. (2010). "Industrial Policy in Chile", *IADB Working Paper No 170*. Washington, DC: Inter-American Development Bank.
- Agosin, M; Álvarez, R., Bravo-Ortega C, (2011). "Determinants of Export Diversification Around the World: 1962-2000", *Working Papers Central Bank of Chile 605*, Santiago: Central Bank of Chile.
- Agosin, M. & Bravo-Ortega C. (2012). "The Emergence and Consolidation of the Chilean Wine Industry", in C. Sabel, E. Fernandez-Arias, R. Hausmann, A. Rodriguez-Clare, and E. Stein. (eds.), *Export Pioneers in Latin America*, 119–45. Washington, DC: Inter-American Development Bank.
- Ahmad, M. I., (1990). "Foreign Manufacturing Investment in Resource Based Industries: Comparison Between Malaysia and Thailand, Research Notes and Discussion", *ASEAN Economic Research Unit*, Paper No: 71, Institute of South East Asian Studies, Singapore.
- Ahumada, J.M (2019). *The Political Economy of Peripheral Growth Chile in the Global Economy*, Basingstoke: Palgrave Macmillan.
- Alavi, R. (1996). *Industrialization in Malaysia: import substitution and infant industry performance*. London: Routledge.
- Alavi, R. & S. Hasan (2001) "The impact of TRIMS on Malaysian automotive SME vendors", *Kajian Malaysia*, 19(2), 38-57.
- Altman, M. (2003). "Staple Theory And Export-Led Growth: Constructing Differential Growth", *Australian Economic History Review*, 43 (3), 230-255.
- Amsden, A. (1989). *Asia's Next Giant: South Korea and Late Industrialization*, New York, NY: Oxford University Press.
- Amsden, A. (1994). "Why Isn't the Whole World Experimenting with the East Asian Model to Develop? Review of The East Asian Miracle" *World Development*, 22 (4), 627-633.
- Amsden, A. (2008). "The Wild Ones: Industrial Policies in the Developing World", in N.

- Serra and J. Stiglitz. (eds.). *The Washington Consensus Reconsidered: Towards a New Global Governance*, 95-119, Oxford: Oxford University Press.
- Anderson, L. (1987). "The State in the Middle East and North Africa", *Comparative Politics*, 20 (October).
- Andreoni, A. (2014). "Structural learning: embedding discoveries and the dynamics of production", *Structural Change and Economic Dynamics*, 29, 58-74.
- Andreoni, A. (2018). "The Architecture and dynamics of industrial ecosystems: diversification and innovative industrial renewal in Emilia Romagna", *Cambridge Journal of Economics*, 42 (6), 1613–1642.
- Andreoni, A., & Chang, H. J. (2016). "Industrial policy and the future of manufacturing", *Economia e politica industriale*, 43(4), 491-502.
- Andreoni, A. & Chang H-J. (2017). "Bringing production and employment back into development: Alice Amsden's legacy for a new developmentalist agenda", *Cambridge Journal of Regions, Economy and Society*, 10 (1), 173–187.
- Ang, J. B. (2008). "Determinants of foreign direct investment in Malaysia". *Journal of policy modelling*, 30(1), 185-189.
- Angrist, J.D. & Pischke J.S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton, NJ: Princeton University Press.
- Anuwar, A. (1992). *Malaysia's Industrialization: The Quest for Technology*, Singapore: Oxford University Press
- Araujo, J., Bin G.L., Poplawski-Ribeiro, M., and Zanna L-P. (2012), "Current Account Norms in Natural Resource Rich and Capital Scarce Economies." Manuscript, Washington D.C. : International Monetary Fund.
- Arezki, R. & Van der Ploeg, F. (2008). "Can the natural resource curse be turned into a blessing? Role of trade policies and institutions", *IMF Working Paper 07/55*, Washington, D.C. : International Monetary Fund..
- Arezki R. (2011). "Fiscal Policy in Commodity- Exporting Countries: Stability and Growth" in Arezki, R; T. Gylfason, and A. Sy (eds.) *Beyond the Curse: Policies to harness the power of natural resources*, Washington D.C.: International Monetary Fund.
- Arezki, R., Gylfason, T., Sy, A. (eds.) (2011). *Beyond the Curse: Policies to harness the power of natural resources*, Washington D.C. : IMF.
- Arezki, R., Van der Ploeg, F., Toscani F. (2016). "Shifting Frontiers in Global Resource Extraction: The Role of Institutions", *CEPR Discussion Paper No. 11553*, Retrieved from: http://cepr.org/active/publications/discussion_papers/dp.php?dpno=11553

[Accessed 29 October 2017]

- Ariffin, N.L. & Bell, M. (1999). "Firms, politics and political economy: patterns of subsidiary–parent linkages and technological capability-building in electronics TNC subsidiaries in Malaysia" in Jomo, K.S., Felker, G. and Rasiah, R. (Eds.), *Industrial Technology Development in Malaysia: Industry and Firm Studies*, 150-190, New York: Routledge.
- Ariffin, A.S. & Sahid, M.L.I. (2017). "Competitiveness Analysis of ASEAN Automotive Industry: A Comparison between Malaysia and Thailand", *Journal of Science, Technology and Innovation Policy*, 3(2).
- Ascher, W. (1999). *Why Governments Waste Natural Resources: Policy Failures in Developing Countries*, Baltimore: John Hopkins University Press.
- Athukorala, P. C. (2014). "Growing with global production sharing: The tale of Penang export hub", Malaysia, *Competition & Change*, 18(3), 221-245.
- Austmine (2013) *Australia's New Driver for Growth: Mining, Equipment, Technology and Services*. Austmine and Department of Industry and Science Survey.
- Auty, R. (1993). *Sustaining Development in Mineral Economies: The Resource Curse Thesis*. London: Routledge.
- Auty, R. (1994), *Patterns of Development: Resources, Policy and Economic Growth*, London: Edward Arnold.
- Auty, R. (2004) "Patterns of Rent-Extraction and Deployment in Developing Countries: Implications for Governance, Economic Policy and Performance" *Paper Prepared for the Poverty Reduction and Economic Management Unit (PREM) Seminar*, Washington D.C.: World Bank.
- Auty, R. M. (Ed.). (2001). *Resource abundance and economic development*, Oxford: Oxford University Press.
- Auty, R.M. & Gelb, A.H. (2000). *Political Economy of Resource Abundant States*, Paris: Annual Bank Conference on Development Economics.
- Awang, Z. (1983). *Coalition Politics in Malaysia*. Master's Thesis. Western Michigan University.
- Azhar A.A (2009). "Presentation of Malaysian Palm Oil Industry", *presented at the Skills and Knowledge for Sustainable Development in Africa: Lessons from Singapore and Other Asian Countries*, 21-27 June, Singapore, retrieved from: http://siteresources.worldbank.org/EDUCATION/Resources/278200-1121703274255/1439264-1242337549970/Malaysian_Palm_Oil_Industry.pdf
- Bair, J. (2005) "Global Capitalism and Commodity Chains: Looking Back, Going

Forward”, *Competition & Change*, 9(2), 153–80.

- Barnett, S., & R. Ossowski. (2003). “Operational Aspects of Fiscal Policy in Oil-Producing Countries,” in J. Davis, J. Ossowski, and A. Fedelino, (eds.), *Fiscal Policy Formulation and Implementation in Oil-Producing Countries*, Washington, D.C.: International Monetary Fund.
- Barrientos, S., Gereffi, G., Rossi, A. (2010) “Economic and social upgrading in global production networks: a new paradigm for a changing world”. *International Labour Review*, 150, 319–340.
- Bateman, M. & H-J. Chang (2012). “Microfinance and the Illusion of Development: From Hubris to Nemesis in Thirty Years”, *World Economic Review*, 1, 13-36.
- Bauer, A. & Rietveld, M. (2014). *Institutional Structure of Natural Resource Funds*, New York: Revenue Watch Institute-Vale Columbia Center on Sustainable International Investment, April.
- Bauer, A. (2016). “Lecture notes”, *Course on “Reversing the Resource Curse: Theory and Practices”*, Budapest, 27 April.
- Bauer, C. & Catalán, L. (2017). “Water, Law, and Development in Chile/California Cooperation, 1960–70s”, *World Development*, 90(February): 184–98.
- Bawumia, M., & Halland, H. (2017). “Oil discovery and macroeconomic management: the recent Ghanaian experience”, in Addison T. and Roe, A. (eds) *Extractive Industries: The Management of Resources as a Driver of Sustainable Development*. 220-243. Oxford University Press.
- Beblawi, H., & Luciani, G. (1987). *The Rentier State in the Arab World*, London: Croom Helm.
- Bems, R. & De Carvalho Filho, I. (2011). “The Current Account and Precautionary Savings for Exporters of Exhaustible Resources,” *Journal of International Economics*, 84 (1), 48-64.
- Benavente, J. M. (2016). “Economic Diversification in Latin American Countries: A Way to Face Tough Times Ahead”, in Cherif, R., Hasanov, F., & Zhu, M. (eds) *Breaking the oil spell: The path to diversification*. Washington D.C.: International Monetary Fund.
- Beng, O. K., & Lee, G. B. (2010). “Introduction: Political Masters and Master Plans”, in Beng, O. K., & Lee, G. B (eds.), *Pilot Studies for a New Penang*, Singapore : Institute of Southeast Asian Studies.
- Berg A., Portillo, R., Yang, S.S.S & Zanna, L.F. (2012). “Public Investment in Resource-Abundant Developing Countries”, *IMF Working Paper WP/12/274*, Washington DC: International Monetary Fund.

- Berg A.; Portillo, R. ; Yang S.C. & Zanna L.F. (2012). "Public Investment in Resource-Abundant Developing Countries", *IMF Working Paper WP/12/274*. Washington DC: International Monetary Fund.
- Bernstein, H. (2010). *Class Dynamics of Agrarian Change*. Kumarian Press.
- Best, M. H., & Rasiah, R. (2003). *Malaysian electronics: at the crossroads*. UNIDO, Programme Development and Technical Cooperation Division.
- Bhaduri, A., & Skarstein, R. (1997). *Economic development and agricultural productivity*. Edward Elgar Publishing.
- Bhattacharyya, S. & Hodler, R. (2010). "Natural resources, democracy and corruption", *European Economic Review*, 54 (4), 608–621
- Bin Injau, H. (2011). *Evaluation of multimedia super corridor (MSC Malaysia): contribution in Malaysian economy*. MSc thesis submitted to Ritsumeikan Asia Pacific University.
- Blomström, M., & Kokko, A. (2007). "From natural resources to high-tech production: The evolution of industrial competitiveness in Sweden and Finland" In D. Lederman, & W. F. Maloney (Eds.), *Natural resources, neither curse nor destiny*, 213-256?Washington, DC: Stanford University Press and World Bank.
- Bodin, J. (1967). *Six Books of a Commonwealth*, Oxford: Basil Blackwell.
- Bohn, H. & Deacon R.T. (2000). "Ownership risk, investment, and the use of natural resources", *American Economic Review*, 90 (3), 526–49.
- Bond, J., & Fajgenbaum, J. (2014). "Harnessing Natural Resources for Diversification", *Global Journal of Emerging Market Economies*, 6(2), 119-143.
- Bordeu, E. (1995). 'Exportaciones de Vino: La Importancia del Mejoramiento de la Calidad' (Wine exports: the importance of quality improvements), in P. Meller and R.E. Sáez (eds) :*Chile's export boom: lessons and future challenges*, 73-107. Santiago: CIEPLAN/Dolmen Editores.
- Brautigam, D., Fjeldstad O.H., & Moore M. (2008). *Taxation and State-Building in Developing Countries: Capacity and Consent*, Cambridge: Cambridge University Press.
- Bravo, S. (2009). "Investigacion sobre Salmonicultura en Chile" [Research on Salmon farming in Chile], *Paper presented at XIII Jornadas sobre Pesquerias y Acicultura en Chile: Desafios y Oportunidades*, 4th September 2009, Vina del Mar, Chile.
- Bravo-Ortega, C., & de Gregorio, J. (2007). "The relative richness of the poor? Natural resources, human capital and economic growth" in D. Lederman, & W. F. Maloney (Eds.), *Natural resources, neither curse nor destiny*, 71-99, Washington, DC:

Stanford University Press and the World Bank.

- Bravo-Ortega, C. & Eterovic N. (2015) “A Historical Perspective of a Hundred Years of Industrialization. From Vertical to Horizontal Policies in Chile”. Working Paper No. 399. Santiago: Department of Economics, University of Chile.
- Bravo-Ortega, C. & Muñoz, L. (2015), “Knowledge Intensive Mining Services in Chile: Challenges and Opportunities for Future Development” , Inter-Amecian Development Bank, *Discussion paper n°IDB-DP-418*. Washington D.C. : Inter-Amecian Development Bank.
- Brewer, B. (2011) “Global commodity chains & world income inequalities: the missing link of inequality and the ‘Upgrading paradox’”, *Journal of World Systems Research*, 17, 308–327.
- Bruckner, M., & Arezki, M. R. (2010). “International commodity price shocks, democracy, and external debt”, *IMF Working Paper No. 10-53*. Washington D.C.: International Monetary Fund.
- Brunnschweiler, C. (2008). “Cursing the blessings? Natural resource abundance, institutions, and economic growth”, *World Development*, 36(3), 319-419.
- Bruno, L.C. (2017). “Palm oil plantation productivity during the establishment of the Malaysian refinery sector, 1970–1990”, *Economic History of Developing Regions*, 32(3), 221-269.
- Bursa, M. (2009). *ASEAN automotive market review - Management briefing*, Bromsgrove, UK.
- Cadot, O., Carrère, C. and V. Strauss-Kahn (2013). “Trade diversification, income, and growth: What do we know?”, *Journal of Economic Surveys*, 27(4), 790–812.
- California State Archives (2000). “Chile-California Program Records”, *F3721: 1-572*, California Secretary of State, Sacramento, United States, retrieved from: http://www.oac.cdlib.org/findaid/ark:/13030/tf9b69n9tj/entire_text/
- Cammett, M. C., Diwan, I., Richards, A. & Waterbury J. (2015). *A Political Economy of the Middle East*, 4th Eds, Boulder CO: Westview Press.
- Case, W. (2005). “Malaysia: new reforms, old continuities, tense ambiguities”. *The Journal of Development Studies*, 41(2), 284-309.
- Caselli, F. & Tesei, A. (2016). “Resource windfalls, political regimes and political stability”. *Review of Economics and Statistics*, 98 (3), 573-590.
- Cashin P. & McDermott C.J. (2002) “The Long-Run Behavior of Commodity Prices: Small Trends and Big Variability” *IMF Staff Papers*, 49(2), 175-199.

- Cadot, O., Carrère C., & Strauss-Kahn, V. (2011). "Export diversification: What's behind the hump? ", *The Review of Economics and Statistics*, 93(2), 590–605.
- Centre for Public Policy Studies (2017). "CPPS Policy Factsheet: Oil and Gas", retrieved from: <http://cpps.org.my/wp-content/uploads/2017/10/Oil-and-Gas-Factsheet.pdf> [Accessed 23 September 2018].
- Chandler A.D. (1990) *Scale and Scope: The Dynamics of Industrial Capitalism*, Cambridge, MA : Harvard University Press.
- Chang, H.-J. (1993). "The political economy of industrial policy in Korea". *Cambridge Journal of Economics*, 17(2), 131-157.
- Chang, H.-J. (1994) *The Political Economy of Industrial Policy*. Basingstoke: Palgrave Macmillan.
- Chang, H.-J. (2005). "Industrial policy and East Asia: the miracle, the crisis and the future", in Jomo, K. S. (Ed.). *Manufacturing competitiveness in Asia: how internationally competitive national firms and industries developed in East Asia*. 36-58, London: Routledge.
- Chang, H.-J. (2007a). *Bad samaritans: Rich nations, poor policies, and the threat to the developing world*. New York: Random House Business.
- Chang H.-J. (2007b). "State-Owned Enterprise Reform", *United Nations DESA National Development Strategies Policy Notes*, New York: United Nations Department of Economic and Social Affairs
- Chang, H.-J. (2009). "Industrial Policy: Can We Go Beyond an Unproductive Confrontation?", *A Plenary Paper for ABCDE (Annual World Bank Conference on Development Economics)*, Seoul, South Korea, 22-24 June 2009.
- Chang H.-J. (2010). "Hamlet without the Prince of Denmark: How development has disappeared from today's 'development' discourse", in S. Khan & J. Christiansen (eds.), *Towards New Developmentalism: Market as Means rather than Master*, Abingdon: Routledge.
- Chang, H.-J. (2012). *23 things they don't tell you about capitalism*, New York: Bloomsbury Press.
- Chang, H.-J. (2013). "Comments on Comparative Advantage: The Silver Bullet of Industrial Policy", in J.E. Stiglitz and J.Y. Lin (eds), *The Industrial Policy Revolution: The Role of Government Beyond Ideology*, 39-42, Basingstoke and New York: Palgrave Macmillan.
- Chaudhry, K. A. (1993). "The myths of the market and the common history of late developers." *Politics and society*, 21(3), 245-274.

- Chaudhry, K. A. (1997). *The Price of Wealth: Economies and Institutions in the Middle East*, Ithaca, New York: Cornell University Press.
- Chauvet, L., & Collier, P. (2008). "What are the preconditions for turnarounds in failing states?", *Conflict Management and Peace Science*, 25(4), 332-348.
- Cherif, R. & Hasanov, F. (2012). "Oil Exporters' Dilemma: How Much to Save and How Much to Invest", *IMF Working Paper*, WP/12/4 Washington DC: International Monetary Fund. .
- Cherif, R. & Hasanov, F. (2014). "Soaring of the Gulf Falcons: Diversification in the GCC Oil Exporters in Seven Propositions", *IMF Working Paper* WP/14/177. Washington DC: International Monetary Fund.
- Cherif, R., Hasanov, F., & Wang, L. (2018). "Sharp Instrument: A Stab at Identifying the Causes of Economic Growth" *IMF Working Paper* WP/18/117, Washington DC: International Monetary Fund.
- Cherif, R., & Hasanov, F. (2019). "The Leap of the Tiger: Escaping the Middle-income Trap to the Technological Frontier", *Global Policy*, Retrieved from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/1758-5899.12695>
- Cimoli, M., Dosi, G. & Stiglitz, J. (eds). (2009). *Industrial policy and development: The political economy of capabilities accumulation*, Oxford: Oxford University Press.
- Cole, D.H. (1992). "Debt-Equity Conversions, Debt-for-Nature Swaps, and the Continuing World Debt Crisis", *Articles by Maurer Faculty, Paper 690, Columbia Journal of Transnational Law*, 30, 57-88.
- Collier, P. (2003). "Natural resources, development and conflict: Channels of causation and policy interventions", *World Bank Working Paper*, 28, Washington DC: World Bank.
- Collier, P., Van Der Ploeg, R., Spence, M. & Venables, A.J. (2010), "Managing Resource Revenues in Developing Economies," *IMF Staff Papers*, 51(7), 84-118, Washington DC : International Monetary Fund.
- Collier, P (2011). *The Plundered Planet: Why we Must — and How we Can — Manage Nature for Global Prosperity*, Oxford: Oxford University Press.
- Collier, P. & Laroche, C. (2011). *Catching Up: What LDCs Can Do, and how Others Can Help*, Commonwealth Secretariat, London
- Collier, P. & Laroche, C. (2015). "Harnessing Natural Resources for Inclusive Growth", *Growth Brief*, International Growth Center, March, , retrieved from : www.theigc.org/wp-content/.../IGCGrowthBriefNRMCollier2015.pdf

- Collier, P., & Hoeffler, A. (2009). "Testing the neocon agenda: democracy in resource-rich societies", *European Economic Review*, 53(3), 293-308.
- Collins, J. & J. Lear (1996). "Chile's Free Market Miracle: A Second Look", *Science and Society*, 60(4), 507-09.
- Columbia Center on Sustainable Investment - CCSI (2016a) *Linkages to the Resource Sector The Role of Companies, Government and International Development Cooperation*, Bonn and Eschborn: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- Columbia Center on Sustainable Investment - CCSI (2016b). "Local content in Malaysia", retrieved from: <http://ccsi.columbia.edu/files/2014/03/Local-Content-Malaysia-Petroleum-CCSI-Sept-2016.pdf> [Accessed 17 June 2018].
- Commission on Growth and Development (2008). *The Growth Report*, Washington DC: International Bank for Reconstruction and Development / The World Bank
- Coniglio, N. D., Vurchio, D., Cantore, N., & Clara, M. (2018). "On the evolution of comparative advantage: path-dependent versus path-defying changes". *Inclusive and Sustainable Industrial Development Working Paper Series*, (24). Vienna: UNIDO.
- Conrad, R. (2012) *Zambia's Fiscal Regime in Mining*, London: International Growth Centre.
- Corden, W. M. (1984). "Booming sector and Dutch disease economics: survey and consolidation". *Oxford Economic Papers*, 36(3), 359-380.
- Correa, F. (2018). "Por dónde empezar una política industrial en Chile: Manufacturas del cobre de clase mundial" [Where to start an industrial policy Chile: World class copper manufacturing], in Caldero, D. and Gajardo F. (eds) *Chile del Siglo XXI: Propuestas desde la Economía*, Chapter 5. Santiago: Heinrich Böll.
- Crespi, G., Fernández-Arias, E., & Stein, E. (2014). "Rethinking productive development", in Crespi, G., Fernández-Arias, E., & Stein, E. (eds). *Rethinking productive development*, 3-31. New York: Palgrave Macmillan.
- Crivelli, E. & Gupta S. (2014). "Resource Blessing, Revenue Curse? Domestic Revenue Effort in Resource-Rich Countries", *IMF Working Paper*, No. 14/5, Washington DC: International Monetary Fund.
- CSiro (2014) *The future of mining in Chile*. Santiago: CSiro.
- Davis, G. A. (1995). "Learning to love the Dutch disease: Evidence from the mineral economies". *World Development*, 23(10), 1765-1779.

- Davis, J., Ossowski, R., Daniel, J., & Barnett, S. (2003) "Stabilization and Savings Funds for Nonrenewable Resources.", in *Fiscal Policy Formulation and Implementation in Oil- Producing Countries*, J. Davis, R. Ossowski, and O. Fedelino, (eds.) ,Washington, DC: International Monetary Fund
- Davis, G.A. (2010). "Trade in Mineral resources", *Staff Working Paper ERSD-2010-01*. World Trade Organization: Geneva, retrieved from: https://www.wto.org/english/res_e/reser_e/ersd201001_e.pdf
- Devarajan, S. (2019). "How to use oil revenues efficiently" in Mohaddes, K., Nugent, J. B., & Selim, H. (Eds.), *Institutions and Macroeconomic Policies in Resource-Rich Arab Economies*, Oxford: Oxford University Press.
- Di John, J. (2009). *From Windfall to Curse? Oil and Industrialization in Venezuela, 1920 to the Present*. University Park, PA: Penn State University Press.
- Di John, J. (2010). "Taxation, Resource Mobilisation, and State Performance". *Crisis states Working Paper*, 84. 1-37. London School of Economics.
- Dicken, P. (2007) *Global Shift: Mapping the Changing Contours of the World Economy*, New York: The Guilford Press.
- Diestche, E. (2018). "New Industrial Policy and the Extractive Industries", in Addison A. and A. Roe (eds) *Extractive Industries: The Management of Resources As a Driver of Sustainable Development*, 137-160, Oxford University Press.
- Dolan, C. and J. Humphrey (2000) "Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry", *Journal of Development Studies*, 37(2), 147–76.
- Donough C.R. & Chia, C.C. (2005). "Breeding oil palms for high oil yield in IOI Group: 1. First cycle development of OPGL-derived materials" *Conference Paper at the MPOB National Seminar 2005: Seminar II - Advances in Breeding & Clonal Technologies for Super Yielding Planting Materials*, Seri Kembangan, Selangor, Malaysia
- Echavarria, R., Vázquez Moreno, C. E., & Sherdek, K. (2016). "The resource curse mirage: the blessing of resources and curse of empire?". *Real-World Economics Review*, (75).
- ECLAC (1990). *La cadena de distribución y la competitividad de las exportaciones latinoamericanas: La fruta de Chile* (The distribution chain and competitiveness of Latin American exports: Fruits in Chile). Santiago: Economic Commission for Latin America and the Caribbean.
- Edwards, C. (1992). "Malaysian Industrial Policy in the 1990s" in R. Adhikari, C. Kirkpatrick, and J. Weiss (eds). *Industrialization and Trade Policy Reform in Developing Countries*, 153-69, Manchester: Manchester University Press.

- Edwards, C. (1995). "East Asia and Industrial Policy in Malaysia: Lessons for Africa?", in H. Stein (ed) *Asian Industrialization and Africa*, 239-256, London: Palgrave Macmillan.
- EITI (2018b) *Rapport Mali 2016*. Retrieved from: https://eiti.org/sites/default/files/documents/rapport-itie-mali-2016-version-finale-03.12.2018_0.pdf [Accessed 28 June 2019].
- Ericson, M. & Löf, O. (2018). "Mining's Contribution to Low- and Middle-income Economies", in Addison T. and Roe, A. (eds) *Extractive Industries: The Management of Resources as a Driver of Sustainable Development*, 51-70, Oxford: Oxford University Press.
- Esanov, A. (2012). *Diversification in Resource-Dependent Countries: Its Dynamics and Policy Issues*, Natural Resource Governance Institute, retrieved from: <http://www.resourcegovernance.org/analysis-tools/publications/diversification-resource-dependent-countries>
- Eubank, N. (2012). "Taxation, Political Accountability and Foreign Aid: Lessons from Somaliland", *Journal of Development Studies*, 48(4), 465-480.
- Evans, P. (1995). *Embedded Autonomy: States and Industrial Transformation*. Princeton, NJ: Princeton University Press.
- Farooki, M. & Kaplinsky, R. (2012). *The impact of China on global commodity prices: The global reshaping of the resource sector?* London: Routledge.
- Farzanegan, M. R. (2011). "Oil revenue shocks and government spending behavior in Iran?". *Energy Economics*, 33(6), 1055-1069.
- Federation of Malaysian Manufacturers (2018) *Petrochemical Industry in Malaysia*. Retrieved from: https://www.fmm.org.my/upload/Country_Report_for_Petrochemical.pdf [Accessed 15 July 2019].
- Findlay, R.E (1973), *International trade and development theory*. New York: Columbia University Press.
- Ffrench-Davis, R. (1973). *Políticas económicas en Chile: 1952-70*, Santiago: Ediciones Nueva Universidad.
- Ffrench-Davis, R. & R.E. Sáez (1995), "Comercio y desarrollo industrial en Chile" [Trade and industrial development in Chile] *Collección de Estudios CIEPLAN* 41, 67-96.
- Ffrench-Davis, R. (2002). *Economic Reforms in Chile. From Dictatorship to Democracy*. Ann Arbor, MI: University of Michigan Press.
- Findlay, R. & Lundahl, M. (1999). "Resource-Led Growth - A Long-Term Perspective:

The Relevance of the 1870-1914 Experience for Today's Developing Economies". *WIDER Working Papers (1986-2000)*.

Fold, N. & Whitfield, L. (2012). "Developing a palm oil sector: the experiences of Malaysia and Ghana compared". *DIIS Working Paper n.08*. Copenhagen: Danish Institute for International Studies.

Fosu, A. K. (1996). "Primary exports and economic growth in developing countries". *World Economy*, 19(4), 465-475.

Friedman, M. (1957). *The Permanent Income Hypothesis: A Theory of the Consumption Function*, New Jersey: Princeton University Press.

Fuenzalida, E.F. (1984). "Institutionalization of Research in Chile's Universities: 1953–1967", in R.M. Garrett (ed.) *Education and Development*, 55–122. London: Croom Helm.

Fuentes, R. (2010). "Managing Natural Resources Revenue: The case of Chile", *OxCarre Working Papers 040*, Oxford Centre for the Analysis of Resource Rich Economies. Retrieved from: <https://ideas.repec.org/p/oxf/oxcrwp/040.html>

Fundación Chile (2012). *Guía Programa proveedores de clase mundial, [World Class Supplier Programme Guidelines]*, Retrieved from: <https://fch.cl/wp-content/uploads/2015/04/Guia-Programa-Proveedores-de-Clase-Mundial1.pdf> [Accessed 29 October 2017]

Fundación Chile (2014). *Proveedores de la minería: Segundo estudio de caracterización [Mining suppliers: 2nd characterization study]*, Retrieved from: <https://fch.cl/wp-content/uploads/2015/03/Estudio-de-Characterizacion-de-Proveedores-de-la-mineria-2014.pdf> [Accessed 29 October 2017]

Fundación Chile (2015). *Proveedores de la minería chilena. Reporte de exportaciones 2010-2014 [Mining Suppliers in Chile: Exports report 2010-2014]*, Retrieved from: <http://programaaltaley.cl/wp-content/uploads/2015/10/Reporte-de-Exportaciones-VD-25.08.2015.pdf> [Accessed 29 October 2017]

Gale, B. (1981). "Petronas: Malaysia's National Oil Corporation", *Asian Survey*, 21 (11), 1129-1144.

Gallagher, K., & Porzecanski, R. (2010). *The dragon in the room: China and the future of Latin American industrialization*, Stanford: Stanford University Press.

Gelb, A. et al. (1988). *Oil windfalls - Blessing or curse?*. Washington, DC: World Bank, retrieved from: <http://documents.worldbank.org/curated/en/1988/10/2827247/oil-windfalls-blessing-or-curse>. [Accessed 19 December 2017]

Gelb, A. Benjamin, N.C., Devarajan, S. & Weiner, R.J (1989). "The Dutch Disease in a Developing Country: Oil Reserves in Cameroon," *Journal of Development*

Economics, 30.

- Gelb, A. & Grasmann, S. (2009). "Déjouer la malédiction pétrolière", *Afrique contemporaine*, 229(1), 87-135.
- Gelb, A. (2010). "Economic Diversification in Resource Rich Countries", Lecture at a high-level seminar on *Natural resources, finance, and development: Confronting Old and New Challenges*, organized by the Central Bank of Algeria and the International Monetary Fund Institute in Algiers, 4-5 November.
- Gelb, A., Tordo, S. & Halland, H. (2014a). "Sovereign Wealth Funds and Domestic Investment in Resource-Rich Countries: Love Me, or Love Me Not?" *The World Bank*, 133, 1-5.
- Gelb, A. and Tordo, S. and Halland, H. and Arfaa, N. and Smith, G. (2014b), "Sovereign Wealth Funds and Long-Term Development Finance: Risks and Opportunities". *World Bank Policy Research Working Paper No. 6776*. Washington D.C.: World Bank
- Gereffi, G. (1994) "The organization of buyer-driven global commodity chains: How U.S. retailers shape overseas production networks", in G. Gereffi, M. Korzeniewicz (eds) *Commodity Chains and Global Capitalism*, 95–122. Westport, CT: Praeger.
- Gereffi, G. (1999) "International Trade and Industrial Upgrading in the Apparel Commodity Chain", *Journal of International Economics*, 48, 37–70.
- Gereffi, G., Korzeniewicz, M. (1994) *Commodity Chains and Global Capitalism*. Westport, Connecticut: Praeger.
- Gereffi, G., Humphrey, J., Sturgeon, T. (2005) "The governance of global value chains". *Review of International Political Economy*, 12, 78–104.
- Gerschenkron, A. (1962). *Economic backwardness in historical perspective: a book of essays*. Cambridge, MA: Belknap Press of Harvard University Press.
- Gibbon, P., Ponte, S. (2005). *Trading Down: Africa, Value Chains, and the Global Economy*. Philadelphia: Temple University Press.
- Goh, B.L. (2002). *Modern Dreams: An Inquiry into Power, Cultural Production, and the Cityscape in Contemporary Urban Penang, Malaysia*, Ithaca, United States: Cornell University Press
- Goldthorpe. C.C. (2015). *Rubber Manufacturing in Malaysia: Resource-based Industrialization in Practice*, Singapore: NUS PRESS.
- Gopal, J. (1999). "Malaysia's Palm Oil Refining Industry: policy, growth, technical change and competitiveness", Jomo K.S., Felker G. and Rasiah R. (eds), *Industrial*

Technology Development in Malaysia: Industry and Firm Studies, London: Routledge.

Gopal, J. (2001). *The Development of Malaysia's Palm Oil Refining Industry: Obstacles, Policy and Performance*. PhD. Thesis, Imperial College, London.

Gourdon, J. (2010). "FDI Flows and Export Diversification: Looking at Extensive and Intensive Margins," in by J. Lopez-Calix, P. Walkenhorst, and N. Diop (eds.), *Trade Competitiveness of the Middle East and North Africa*, Washington: World Bank.

Gozgor G. and M. Can (2017). "Causal Linkages among the Product Diversification of Exports, Economic Globalization and Economic Growth", *Review of Development Economics*, 21(3), 888–908.

Griffith-Jones, S., Luz Martínez Sola M. & Petersen, J. (2018). "The Role of CORFO in Chile's Development: Achievements and Challenges", in S. Griffith-Jones and J.A. Ocampo (eds), *The Future of National Development Banks*, New York: Oxford University Press.

Grosse, R. (2009). "Chile as an Example of the Augmented Diamond", in Van Den Bulcke, D., Verbeke, A., & Yuan, W. (eds.), *Handbook on small nations in the global economy: The contributions of multinational enterprises to national economic success*, 170–93, Cheltenham, UK: Edward Elgar Publishing.

Grossman, G. M., and E. Helpman (1991). "Trade, knowledge spillovers, and growth", *European Economic Review*, 35(2–3), 517–526.

Grunstein, M.C., Diaz-Wionczek, (2017). "Local Content in the Petroleum Industry – Mexico". *Baker Institute*. Retrieved from: <https://www.bakerinstitute.org/media/files/files/c43bd724/MEX-pub-LocalContent-020817.pdf>. [Accessed 23 October 2018].

Gylfason, T., Herbertsson, T. T., & Zoega, G. (1999). "A mixed blessing: natural resources and economic growth". *Macroeconomic dynamics*, 3(2), 204-225

Gylfason, T. (2001). "Natural Resources, Education, and Economic Development.", *European Economic Review*, 45(4–6), 847–59.

Gylfason, T. (2011). "Natural Resources: A Mixed Blessing?", in R. Arezki, T. Gylfason and A. Sy (eds.) *Policies to Harness the Power of Natural Resources*, 7-34. Washington, DC: International Monetary Fund.

Haggard, S. (2018). *Developmental States*, Cambridge: Cambridge University Press.

Hamilton, K., Ruta, G. & Tajibaeva, L. (2006). "Capital accumulation and resource depletion: a Hartwick rule counterfactual", *Environmental & Resource Economics*, 34, 517–533.

- Hartwick, J. M. (1978). "Substitution among exhaustible resources and intergenerational equity". *The Review of Economic Studies*, 45(2), 347-354.
- Hauge, J. (2017) *African industrial policy in an era of expanding global value chains: the case of Ethiopia's textile and leather industries*. PhD thesis: University of Cambridge.
- Hausmann, R. & Rodrik D. (2006). "Doomed To Choose: Industrial Policy As Predicament", Center for International Development Paper, Cambridge, MA: Center for International Development, Harvard University, retrieved from: <https://drodrik.scholar.harvard.edu/files/dani-rodrik/files/doomed-to-choose.pdf>
- Hausmann, R., Hwang, J., & Rodrik, D. (2007). "What you export matters", *Journal of economic growth*, 12(1), 1-25.
- Hausmann, R. & Klinger, B. (2007). "The Structure of the Product Space and the Evolution of Comparative Advantage", *CID Working Paper No. 146*. Cambridge, MA: Harvard University Center for Economic Development.
- Hausmann R., Klinger B., López-Cálix JR. (2010). "Export Diversification in Algeria", in J.R. López-Cálix, P. Walkenhorst, and N. Diop (eds) *Trade Competitiveness of the Middle East and North Africa*, 63-101. Washington, DC: The World Bank.
- Heller, P.R.P., Marcel, V., (2012). "Institutional Design in Low-Capacity Hotspots". *Revenue Watch Institute*, Retrieved from: <https://resourcegovernance.org/sites/default/files/documents/institutional-design-in-low-capacity-oil-hotspots.pdf> [Accessed 17 March 2019].
- Henderson, J. (1993) "Against the Economic Orthodoxy: On the Making of the East Asian Miracle". *Economy and Society* 22(2): 200–17.
- Henstridge, M. and Roe, A. (2018) "The Macroeconomic Management of Natural Resources", in Addison A. and A. Roe (eds) *Extractive Industries: The Management of Resources As a Driver of Sustainable Development*, 161-178, Oxford University Press.
- Hertog, S. (2010). "Defying the resource curse: explaining successful state owned enterprises in rentier states", *World Politics*, 62(2), 261-301.
- Hidalgo, C., Klinger, B., Barabasi, A. and Hausmann, R. (2007). "The Product Space Conditions the Development of Nations", *Science Magazine*, 317(5837), 482-487.
- Hidalgo, C., Peterson, K., ; Smith, D., Foley, H. (2014), "Extracting with purpose: Creating shared value in the oil and gas and mining sector's companies and communities", *Shared Value Initiative*, retrieved from: <https://www.sharedvalue.org/groups/bhp-billiton-engages-local-suppliers-chile>. [Accessed 13 October 2017].

- Hirschman, A.O. (1958). *The Strategy of Economic Development*, New Haven, Conn.: Yale University Press.
- Hirschman, A. O. (1967). "The principle of the hiding hand". *The public interest*, 6(10), 10-23.
- Hirschman, A.O. (1981). *Essays in Trespassing: Economics to Politics and Beyond*, Cambridge: Cambridge University Press.
- Hirschman, A.O. (2013). *The Essential Hirschman*, Princeton, New Jersey : Princeton University Press.
- Hobday, M. (1999). "Understanding innovation in electronics in Malaysia" in Jomo, K.S., Felker, G. and Rasiah, R. (Eds.), *Industrial Technology Development in Malaysia: Industry and Firm Studies*, New York : Routledge, 76-106.
- Hope, C. J. (2019). *Developmentalism, dependency, and the state: industrial policy and structural transformation in Namibia since 1900*. PhD thesis: University of Cambridge.
- Hosono, A. (2016). "Genesis of Chilean Salmon Farming" in A. Hosono, M. Iizuka and J. Katz (eds.), *Chile's Salmon Industry: Policy Challenges in Managing Public Goods*, 21-44. Tokyo: JICA Research Institute.
- Hui, W.C (2008). "Oil and Gas Management and Revenues in Malaysia", *Forum of Federations*, retrieved from: <http://www.forumfed.org/libdocs/OilGas2008/MalaysiaOilGas2008.pdf>
- Humphrey, J. and H. Schmitz (2002) "How Does Insertion in Global Value Chains Affect Upgrading in Industrial Clusters?", *Regional Studies* 36(9), 1017-27.
- Humphreys, M. ; Sachs J.D. & Stiglitz, J. (eds.) (2007). *Escaping the Resource Curse*, New York: Columbia University Press.
- Ibn Khaldun (1967 [1377]). *The Muqaddimah. Translated from Arabic by Franz Rosenthal*. Princeton: Princeton University Press.
- Iizuka, M. (2004). "Organizational capability and export performance: The salmon industry in Chile", *Paper presented at the 2004 DRUID Winter Conference*, University of Aalborg, January 22-24, 2004, Aalborg, Denmark.
- Iizuka, M, (2007). "Global standards and local producers: Knowledge governance and the rise of the Chilean Salmon Industry", *PhD thesis*, SPRU, University of Sussex.
- Iizuka, M & Gebreeyesus, M, (2012). "A systemic perspective in understanding the successful emergence of non-traditional exports: Two cases from Africa and Latin America", *MERIT Working Papers 052*, United Nations University- Maastricht

Economic and Social Research Institute on Innovation and Technology (MERIT), retrieved from: <https://ideas.repec.org/p/unm/unumer/2012052.html>.

Iizuka, M. & J. Katz (2010). “Natural Resource Industries: Tragedy of the Commons and the Case of Chilean Salmon Farming”, *UNU-MERIT Working Paper No. 61*, Maastricht: Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT), United Nations University, retrieved from : <https://econpapers.repec.org/paper/unmunumer/2010061.htm>

Iizuka, M., Roje, P. & Vera, V. (2016). “The Development of Salmon Aquaculture in Chile into an Internationally Competitive Industry: 1985–2007”, in A. Hosono, M. Iizuka and J. Katz (eds.), *Chile’s Salmon Industry: Policy Challenges in Managing Public Goods*, 75-108 Tokyo: JICA Research Institute.

Iizuka, M. & Zanolungo J.P. (2016). “Environmental Collapse and Institutional Restructuring: The Sanitary Crisis in the Chilean Salmon Industry”, in A. Hosono, M. Iizuka and J. Katz (eds.), *Chile’s Salmon Industry: Policy Challenges in Managing Public Goods*, 109-138. Tokyo: JICA Research Institute.

Iizuka, M., & Gebreeyesus, M. (2017). “Using Functions of Innovation Systems to Understand the Successful Emergence of Non-traditional Agricultural Export Industries in Developing Countries: Cases from Ethiopia and Chile”, *The European Journal of Development Research*, 29(2), 384-403.

Ikpe, E. (2018). “The Enduring Relevance of the Developmental State Paradigm Across Space and Time: Lessons for Africa on Structural Transformation and Agriculture in Oil-Rich Contexts”. *Journal of Asian and African Studies*, 53(5), 764-781.

Imbs, J. and R. Wacziarg, (2003). “Stages of Diversification”, *American Economic Review*, 93(1), 63-86.

International Monetary Fund (2000). “Algeria: Recent Economic Developments”, *IMF Staff Country report No. 00/105*, International Monetary Fund: Washington D.C., retrieved from : <https://www.imf.org/external/pubs/ft/scr/2000/cr00105.pdf> [Accessed 2 February 2019]

International Monetary Fund (2012a). “ *Fiscal Regimes for Extractive Industries: Design and Implementation*”, Washington D.C. : International Monetary Fund, retrieved from: <https://www.imf.org/external/np/pp/eng/2012/081512.pdf> [Accessed 4 February 2019]

International Monetary Fund (2012b). *Macroeconomic Policy Frameworks for Resource-Rich Developing Countries*, Washington, D.C.: International Monetary Fund.

International Monetary Fund (2013) *Energy Subsidy Reform: Lessons and Implications*. Washington D.C.: International Monetary Fund

- International Monetary Fund (2015). “Malaysia: Selected issues”, *Selected Issues Paper on Malaysia*, January 30, Washington, D.C.: International Monetary Fund, retrieved from: <https://www.imf.org/external/pubs/ft/scr/2015/cr1559.pdf>
- International Monetary Fund (2016). “Chad: Selected Issues”, *IMF Country Report No. 16/275*, retrieved from: <http://www.imf.org/~media/Files/Countries/ResRep/TCD/2016-8-chad-si-4-oil-sector-transparency-and-integrity> [Accessed 4 February 2019]
- International Monetary Fund (2018a). “Malaysia: selected issues”, *IMF Country Report No. 18/62*, Washington D.C.: International Monetary Fund.
- Innis, H. A. (1930). *The fur trade in Canada: An introduction to Canadian economic history*, New Haven, CT: Yale University Press.
- Innis, H. A. (1940). *The cod fisheries: The history of an international economy*, Toronto, Canada: University of Toronto Press.
- Innis, H. A. (1956). *Essays in Canadian economic history*, Toronto, Canada: University of Toronto Press.
- International Bank for Reconstruction and Development (IBRD) (1955). *The Economic Development of Malaya*, retrieved from : <http://documents.worldbank.org/curated/en/172531468774650530/pdf/multi0page.pdf> [Accessed 21 September 2018].
- IPSOS (2012). *E&E Sector Study on the Supply-Demand of Talent in Malaysia*, ISPOS Final Report, retrieved from: https://www.talentcorp.com.my/clients/TalentCorp_2016_7A6571AE-D9D0-4175-B35D-99EC514F2D24/contentms/img/publication/E&E%20Sector%20Study%20-%20Abridge.pdf [Accessed 3 June 2019]
- International Resource Panel (2019). *Mineral Resource Governance in the 21st Century: Gearing extractive industries towards sustainable development*, Nairobi, Kenya : United Nations Environment Programme.
- Isaksson, A. (2009). “Public Capital, Infrastructure and Industrial Development”, *UNIDO Research And Statistics Branch*, Working Paper 15/2009.
- Jadresic, E. (1986). “Evolución del empleo y desempleo en Chile: 1970-85” [Evolution of employment and unemployment in Chile: 1970-85], *Colección Estudios CIEPLAN* 20, Santiago: CIEPLAN.
- James, A. (2015). “The Resource Curse: a Statistical Mirage?”, *Journal of Development Economics*, 114 (May), 55–63.
- Jensen, N., & Wantchekon, L. (2004). “Resource wealth and political regimes in Africa”, *Comparative political studies*, 37(7), 816-841.

- Jetter M. and A. Ramirez-Hassan (2015). "Want export diversification? Educate the kids first", *Economic Inquiry*, 53(4), 1765-1782.
- Jesudason, J.V. (1989). *Ethnicity and the Economy: The State, Chinese Business, and Multinationals in Malaysia*, New York: Oxford University Press.
- Johari A., Nyakuma B.B., Nor S.H., Mat R., Hashim H., Ahmad A., Zakaria Z.Y., Abdullah T.A. (2015). "The Challenges and prospects of palm oil based biodiesel in Malaysia", *Energy*, 81, 255-261
- Johnson, C. (1982). *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925–1975*, Stanford, CA: Stanford University Press.
- Jomo, K.S. (1993). *Industrialising Malaysia: Policy, performance, prospects*, Routledge: New York.
- Jomo K.S. & Chris E. (1993). "Malaysian Industrialisation in Historical Perspective", in *Industrialising Malaysia: Policy, performance, prospects*, Jomo K.S (Ed.), 1993, New York : Routledge, 14-39
- Jomo, K.S. & Gomez, E.T. (1997). *Malaysia's Political Economy: Politics, Patronage and Profits*, New York: Cambridge University Press.
- Jomo, K.S., Felker, G. & Rasiah, R. (eds.) (1999). *Industrial Technology Development in Malaysia: Industry and Firm Studies*, Routledge : London.
- Jomo K.S. (2007), *Malaysian Industrial Policy*, Singapore : Singapore University Press.
- Kahn, M. E. & Mohaddes, K. & Ng, R. N. C. & Pesaran, M. H. & Raissi, M. & Yang, J-C. (2019). "Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis," *Cambridge Working Papers in Economics* (1965), Faculty of Economics, University of Cambridge.
- Kalecki, M. (1976). *Essays on developing economies*. Hassocks, Eng.: Harvester Press.
- Kaldor, N. (1967). *Strategic Factors in Economic Development*, Ithaca: New York State School of Industrial and Labor Relations, Cornell University.
- Karl, T.L. (1997). *The Paradox of Plenty: Oil Booms and Petro States*, Berkeley: University of California Press.
- Katz, J. (1984). "Domestic Technological Innovation and Dynamic Comparative Advantage: Further Reflections on a Comparative Case Study Program", *Journal of Development Economics*, 16(1), 13–38.
- Katz, J. (2006). "Economic, Institutional and Technological Forces Inducing the Successful Inception of Salmon Farming in Chile", in V. Chandra (ed.), *Technology, Adaption and Exports: How Some Countries Got it Right*, 193–224. Washington,

D.C.: World Bank.

Kay, C. (1997). "Globalisation, Peasant Agriculture and Reconversion in Chile", *Bulletin of Latin American Research* 16(1), 11–24.

Kay, C. (2002). "Chile's Neoliberal Agrarian Transformation and the Peasantry", *Journal of Agrarian Change* 2(4), 464–501.

Khan, M. (2007). "Governance, Economic Growth and Development since the 1960s", *DESA Working Paper No. 54 ST/ESA/2007/DWP/54*.

Khan, M. (2010). *Political Settlements and the Governance of Growth-Enhancing Institutions*. Unpublished.

Khera, HS, (1976). *The oil palm industry of Malaya: An economic study*, Kuala Lumpur: Penerbit Universiti Malaya.

Klinger, B., & Lederman, D. (2004). *Discovery and development: An empirical exploration of 'new' products*. Washington D.C.: The World Bank

Klueh, U.H., Pastor, G., Segura, A. (2009). "Policies to improve the local impact from hydrocarbon extraction: observations on West Africa and possible lessons for Central Asia". *Energy Policy*, 37 (3), 1128–1144.

Korinek, J. (2013). "Mineral Resource Trade in Chile: Contribution to Development and Policy Implications", *OECD Trade Policy Papers*, No. 145, Paris : OECD Publishing..

Korinek, J. & Ramdoo, I. (2017). "Local content policies in mineral-exporting countries", *OECD Trade Policy Papers*, (209), Paris :OECD Publishing.

Kuchiki, A. (2007). "A flowchart approach to Malaysia's automobile industry cluster policy", *IDE Discussion Paper No. 120*, Chiba, Japan: Institute of Developing Economies.

Kuan, M.L (2016). *Manufacturing Productive Capabilities: Industrial Policy and Structural Transformation in Singapore*. PhD thesis. University of Cambridge.

Kurtz, M. (2001). "State developmentalism without a Developmental State: The public foundations of the 'Free Market Miracle' in Chile". *Latin American Politics and Society*, 43(2), 1-25.

Lahn, G., & Stevens, P. (2018). "Re-evaluating What We Know about Extractives and Economic Development", in Addison A. and A. Roe (eds) *Extractive Industries: The Management of Resources As a Driver of Sustainable Development*, 93-113, Oxford University Press.

Lall, S. (1992). "Technological Capabilities and Industrialization", *World Development*

20(2),165–86.

- Lall, S. (1995). “Malaysia: industrial success and the role of the government”. *Journal of International Development*, 7(5), 759-773.
- Lall, S. (2001). “Competitiveness Indices and Developing Countries : An Economic Evaluation of the Global Competitiveness Report”, *World Development*, 29 (9), 1501–1502.
- Larsen, M. N., Yankson, P., & Fold, N. (2009). “Does Foreign Direct Investment (FDI) create linkages in mining? The case of gold mining in Ghana”, in A. Sumner, D. Sanchez- Ancochea, & E. Rugraff (Eds.), *Transnational corporations and development policy: Critical perspectives*, 247-273, London, UK: Palgrave Macmillan.
- Leamer, E. (1984). *Sources of International Comparative Advantage: Theory and Evidence*, Cambridge, MA: MIT Press.
- Leamer, E. (1995). “The Heckscher-Ohlin Model in Theory and Practice”, *Princeton Studies in International Finance*, (77), International Finance Section, Department of Economics, Princeton University.
- Lebdioui, A. (2017). *Le régime juridique de l'accès aux réserves d'hydrocarbures, enjeux de la coopération entre Etats producteurs et investisseurs étrangers*. Thèse de doctorat: Paris 2.
- Lebdioui, A.A. (2018). “Uncovering the high value of neglected minerals: ‘Development Minerals’ as inputs for industrial development in North Africa”. *The Extractive Industries and Society*. Retrieved from: <https://doi.org/10.1016/j.exis.2018.09.018>
- Lebdioui, A.A. (2019a). “Local Content in Extractive Industries: Evidence and Lessons from Chile's Copper Sector and Malaysia's Petroleum Sector”, *The Extractive Industries and Society*, Retrieved from: <https://doi.org/10.1016/j.exis.2019.05.001>
- Lebdioui, A.A. (2019b). “Chile's Export Diversification since 1960: A Free Market *Miracle* or *Mirage*?”. *Development and Change*, 50(6): 1624-1663.
- Lederman, D., & Maloney, W. F. (2007). “Trade structure and growth” in D. Lederman, & W. F. Maloney (Eds.), *Natural resources, neither curse nor destiny*, 15-39), Washington, DC: Stanford University Press and World Bank.
- Lee, K. (2013). *Schumpeterian Analysis of Economic Catch-up, Knowledge, Path-creation and the Middle-Income Trap*, Cambridge: Cambridge University Press.
- Lee, K (2019) *The Art of Economic Catch-Up: Barriers, Detours, and Leapfrogging*. Cambridge University Press.
- Lee, K. and Malerba, F. (2017). “Catch-up cycles and changes in industrial leadership:

- windows of opportunity and responses of firms and countries in the evolution of sectoral systems”. *Research Policy*, 46, 338–351.
- Lee, K., Szapiro, M., & Mao, Z. (2018). “From global value chains (GVC) to innovation systems for local value chains and knowledge creation”. *The European Journal of Development Research*, 30(3), 424-441.
- Leftwich, A. (1995). “Bringing Politics Back in: Towards a Model of the Developmental State”, *Journal of Development Studies* 31(3), 400–27.
- Leutert, H-G. & Sudhoff, R. (1999). “Technology capacity building in the Malaysian automotive industry” in Jomo, K.S., Felker, G. and Rasiah, R. (Eds), *Industrial Technology Development in Malaysia: Industry and Firm Studies*, New York, Routledge, 247-173.
- Lewis, W.A. (1955). “The Theory of Economic Growth.”, *The Journal of Economic History*, 18(01), 70-73.
- Lim, S ; Teong, L.K, (2010). “Recent trends, opportunities and challenges of biodiesel in Malaysia: an overview”, *Renewable and Sustainable Energy Reviews*, 14(3), 938-954.
- Lin, Y.L. & Treichel, V. (2014). “Making industrial policy work for development” in Salazar-Xirinachs J.M.; Nübler, I. and Kozul-Wright, R., *Transforming Economies: Making Industrial Policy Work For Growth, Jobs And Development*, Geneva: International Labour Organization.
- Lin, J. & Chang, H.-J. (2009). “Should Industrial Policy in Developing Countries Conform to Comparative Advantage or Defy it? A Debate Between Justin Lin and Ha-Joon Chang”, *Development Policy Review*, 27, 483–502.
- List, F. (1937) [1983] *The Natural System of Political Economy*, translated and edited by William O. Henderson. Reprint, London: Frank Cass.
- Loh, S. K., & Choo, Y. M. (2013). “Prospect, challenges and opportunities on biofuels in Malaysia”, *Advances in biofuels*, 3-14, Boston, MA: Springer.
- Lucas, R.(1990); “Why Doesn’t Capital Flow from Rich to Poor Countries,” *American Economic Review Papers and Proceedings*, 80 (2), 92-96.
- Lundvall, B. Å. (ed.). (2010). *National systems of innovation: Toward a theory of innovation and interactive learning* (Vol. 2). Anthem press.
- MAA (2018a) *Summary of Sales & Production Data*. Retrieved from: http://www.maa.org.my/info_summary.htm [Accessed 8 March 2019].
- MAA (2018b) *Market Review 2017*, Retrieved from: http://www.maa.org.my/pdf/Market_Review_2017.pdf [Accessed 8 March 2019].

- Mackintosh, W. A. (1923). Economic factors in Canadian history. *Canadian Historical Review*, 4(1), 12-25.
- Mackintosh, W. A. (1939). *The economic background of dominion-provincial relations: Appendix III of the royal commission report on dominion-provincial relations*. Ottawa, Canada: King's Printer.
- Maggi, C.C. (2006) "The Salmon Farming and Processing Cluster in Southern Chile", in C. Pietrobelli & R. Rabellotti (eds) *Upgrading to Compete: Global Value Chains, Clusters and SMEs in Latin America*, 4-40, Washington, DC: Inter-American Development Bank.
- Mahathir, M. (2011). *A Doctor in the House: The Memoirs of Tun Dr. Mahathir Mohamad*, Kuala Lumpur: MPH.
- Mahdavy, H. (1970), "The Pattern and Problems of Economic Development in Rentier States: The Case of Iran", in M.A. Cook (ed). *Studies in the Economic History of the Middle East*, 428-486. Oxford. Oxford University Press.
- Mahidin, M.U. and Kanageswary, R. (2004) *The Development of the Automobile Industry and the Road Ahead*. Kuala Lumpur: Department of Statistics, Malaysia.
- Mahmood, A.R (2013), "Monetizing Gas Resources for National Development: Malaysia's Experience", *Gas Training Seminar: Access to Sustainable Energy for All With Gas*, Abidjan, Cote d'Ivoire, 4-5 November.
- Malaysia Petrochemicals Association (2016), "Country Report Presented to the Asia Petrochemical Industry Conference", *Asia Petrochemical Industry Conference*, Japan, Retrieved from: <http://cpmaindia.com/pdf/apic-country-2017/apic2017-malaysia-report.pdf> [Accessed 14 February 2019]
- Malerba, F. (2002). "Sectoral systems of innovation and production". *Research policy*, 31(2), 247-264.
- Maloney, W. (2002). "Missed Opportunities: Innovation and Resource-Based Growth in Latin America." *Economia*, 3 (1), 111-51.
- Marcel, V. (2006). *Oil Titans: National Oil Companies in the Middle East*. Washington DC: Brookings Institution Press.
- Matsen, E., & Torvik, R. (2005). "Optimal Dutch disease". *Journal of Development Economics*, 78(2), 494-515.
- Mau, K. (2016). "Export diversification and income differences reconsidered: the extensive product margin in theory and application", *Review of the World Economy*, 152 (2), 351-381.
- Mayorga, E.A. (2009). "Extractive industries value chain: a comprehensive integrated

- approach to developing extractive industries”. *Extractive industries and development series*, (3), Washington, DC: World Bank.
- Mazzucato, M. (2015). *The entrepreneurial state: Debunking public vs. private sector myths* (Vol. 1). Anthem Press.
- McConnell, W.R. (2008), “The Nitrate Industry of Chile”, *Journal of Geography*, 16(6), 211-214.
- McKinsey (2016) *Moving Saudi Arabia’s economy beyond oil*, retrieved from <http://www.mckinsey.com/global-themes/employment-and-growth/moving-saudi-arabias-economy-beyond-oil> [Accessed 23 July 2018]
- Mehlum, H., Moene, K., & Torvik, R. (2006). “Institutions and the resource curse”. *The Economic Journal*, 116(508), 1-20.
- Meller, P. and I. Zenteno (2013) “Diversificación de Exportaciones en América Latina: Experiencias Y Lecciones Para Políticas Públicas” [Export diversification in Latin America: Experience and lessons for public policies] in P. Meller (ed.) *Recursos Naturales y Diversificación Exportadora. Una mirada de futuro para América Latina* [Natural resources and export diversification: future outlook for Latin America] 123–66. Santiago: CIEPLAN.
- Meller, P; Gana, J. (2015), “El cobre chileno como plataforma de innovación tecnológica”, *Encuentro Annual SECHI*, 24-25 september 2015, Talca, Chile, CIEPLAN, Sociedad de economía de Chile, Retrieved from: http://www.cieplan.org/media/publicaciones/archivos/375/PPT_El_cobre_chileno_como_plataforma_de_innovacion_tecnologica.ppt [Accessed 23 June 2018]
- Meller, P. (2017) *Un Siglo de Economía Política Chilena (1890-1990)* [A century of Chilean Political Economy]. Santiago: CIEPLAN.
- Meller, P. and P. Parodi (2017) *Del programa de proveedores a la innovación abierta en minería*. [From the supplier programme to open innovation in mining] Santiago: CIEPLAN. Retrieved from: www.cieplan.org/media/publicaciones/archivos/403/Del_Programa_de_Proveedores_a_la_Innovacion_Abierta_en_Mineria.pdf [Accessed 23 June 2018]
- Mellor, J. W. (1973). “Accelerated growth in agricultural production and the intersectoral transfer of resources”. *Economic Development and Cultural Change*, 22(1), 1-16.
- Mendez, R. and C. Munita (1989) *La Salmonicultura en Chile* [Salmon farming in Chile]. Santiago: Fundación Chile.
- Meyanathan, S. D. & Ismail, M. S. (1994) “Malaysia”, in S. D. Meyanathan (Ed.) *Industrial Structures and the Development of Small and Medium Enterprise Linkages: Examples from East Asia*, 23-66. Washington, DC: World Bank.

- Mitchell, J. and Stevens, P. (2008). "Resource Depletion, Dependence and Development: Can Theory Help?" *EER Report*. London: Chatham House.
- Mizala, A. (1992), "Las reformas económicas de los años setenta y la industria manufacturera" [The economic reforms of the 1970s and the manufacturing sector], *Colección Estudios CIEPLAN* (35), 153-199.
- Mohaddes, K., & Raissi, M. (2017). "Do sovereign wealth funds dampen the negative effects of commodity price volatility?", *Journal of Commodity Markets*, 8, 18-27.
- Mohd Shah, A. B. (1995) "Peranan sistem vendor dalam pembangunan industri kecil dan sederhana Bumiputera" [The role of vendor system in the development of Bumiputera small and medium industries]. *Paper presented at Bengkel Kebangsaan Penglibatan Bumiputera dalam Industri Kecil dan Sederhana [National Workshop on Bumiputera Involvement in Small and Medium Industries]*, Kuala Lumpur, September.
- Moll, H. (1987). *The economics of oil palm*. Wageningen: Pudoc.
- Moon, C. and R. Prasad (1997) "Beyond the Developmental State: Networks, Politics and Institutions", *Governance* 7(4), 360–86.
- Moore M. and Rakner, L. (2002): "Introduction: The New Politics of Taxation and Accountability". *IDS Bulletin*, 33 (3). 1-9.
- Morales, M., Herrera, J.J., Mushemeza, E., Okiira, J. (2017). "What Matters When It Comes to Adopting Local Content in the Oil and Gas Sector? A Comparative Analysis of Success Factors in Africa and Latin America." Lima: Practical Action.
- Moroney, J.R. (1975) "Natural resource endowments and comparative labor costs: a hybrid model of comparative advantage", *Journal of Regional Science*, 15(2), 139-50.
- Morris, M., Kaplinsky, R., & Kaplan, D. (2012). *One thing leads to another: Promoting Industrialization by Making the Most of the Commodity Boom in Sub-Saharan Africa*. Accessible at <http://tinyurl.com/CommoditiesBook>.
- Mukherjee, H., J.S. Singh, R.N. Fernandez- Chung and T. Marimuthu (2011), "Affirmative action policies in Malaysian higher education", *draft report submitted to the World Bank*, Retrieved from: http://siteresources.worldbank.org/EDUCATION/Resources/278200-1099079877269/547664-1099079956815/547670-1276537814548/Ultima-Revision_Malaysia_Equity-Study-March-23v2.pdf [accessed 18 July 2019].
- Mundle, S. (1985). "The agrarian barrier to industrial growth". *The Journal of Development Studies*, 22(1), 49-80.
- Myrdal G. (1956) *An International Economy: Problems and Prospects*. New York:

Harper & Brothers Publishers.

- Nabli, M., J. Keller, C. Nassaf, and C. Silva-Jauregui, (2008) “The Political Economy of Industrial Policy in the Middle East and North Africa,” in A. Galal (ed) *Industrial Policy in the Middle East and North Africa: Rethinking the Role of the State*. New York: The American University in Cairo Press.
- Nambiappan, B. and Norfadilah, H. (2002) “Counter-Trade: The Malaysian Experience” *Oil Palm Industry Economic Journal*. 2(1), 45-49.
- Nambiappan, B.; Ismail, A., Hashim, N.; Ismail, N. Shahari, D.N.; Nik Idris, Omar. N.; Salleh, K.M. Hassan, N.A.M., Kushairi, A (2018), “Malaysia: 100 Years Of Resilient Palm Oil Economic Performance”, *Journal Of Oil Palm Research*, 30 (March), 13-25.
- Navarro, L. (2018) “The World Class Supplier Program for mining in Chile: Assessment and perspectives, *Resources Policy*, 58, 49-61.
- Neary, J.P. and Van Wijnbergen, S. (1986) *Natural Resources and the Macroeconomy*. Cambridge, MA: MIT Press.
- Nelson R.R. and S.J. Winter (1982) *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.
- Nelson, R.C (2007), “Transnational Strategic Networks and Policymaking in Chile: CORFO’s High Technology Investment Promotion Program” *Latin American Politics and Society*, 49(2), 149-181.
- Neumayer, E. (2004). “Does the “resource curse” hold for growth in genuine income as well?”, *World development*, 32(10), 1627-1640.
- Nordas, H., Vatne, E. and Heum, P. (2003). *The Upstream Petroleum Industry and Local Industrial Development: A Comparative Study*. Bergen: Institute for Research in Economics and Business Administration.
- North, D. C. (1966). *Growth and welfare in the American past: A new economic history*. Englewood Cliffs, NJ: Prentice-Hall.
- North, D.C., Wallis, J.J. and Weingast, B.R. (2009) *Violence and Social Orders: A Conceptual Framework for Interpreting Recorded Human History*. Cambridge University Press.
- NRGI (2014) *Natural Resource Charter (Second Edition)*. New York: NRG.
- Nübler, I. (2014). *Capabilities, productive transformation and development: A new perspective on industrial policies*, Geneva: ILO.

- Nurkse, R. (1961). "International trade theory and development policy". In *Economic Development for Latin America* (pp. 234-274). Palgrave Macmillan, London.
- O'Hearn, D. (1994) "Innovation and the world system hierarchy: British subjection of the Irish Cotton Industry, 1780-1830". *American Journal of Sociology*, 100, 587–621.
- O'Sullivan, A., Rey, M.-E., and Mendez, J.G. (2011). "Opportunities and Challenges in the MENA Region", in *OECD Arab World competitive report*, 43-67.
- OECD (2008). *OECD Review of Agricultural Policies: Chile 2008*. Paris: OECD.
- OECD (2011). "Country profile of innovation: Malaysia", in *OECD Review of Innovation in Southeast Asia*, 181–222. Paris: OECD Directorate for Science, Technology and Industry.
- OECD (2012). "Global Forum on Competition: Competition and Commodity Price Volatility", in *Competition Law and Policy OECD, DAF/COMP/GF(2012)11*. Paris: OECD Directorate For Financial and Enterprise Affairs Competition Committee.
- OECD (2015). *Diagnostic of Chile's Engagement in Global Value Chains*. Paris: OECD Publishing.
- OECD (2016a). *Resource Revenue Earmarking: Comparative Analysis And Lessons Learned*. Paris: OECD.
- OECD (2016b). *OECD Reviews of Innovation Policy: Malaysia 2016*. Paris: OECD.
- OECD (2018a). *Managing And Spending Extractive Revenues For Sustainable Development: Policy Guidance For Resource-Rich Countries*, Paris: OECD.
- OECD and World Bank (2011). *Revisión de Políticas Nacionales de Educación: Programa Becas Chile*. Paris: OECD.
- Okamoto, Y. (2004). "Industrial clusters and IT industries", in A. Kuchiki and M. Tsuji (eds) *Industrial Clusters in Asia: Analyses of their Competition and Cooperation*, 225–99. Chiba, Japan: Institute of Developing Economies,
- Olson, M. (1993). "Dictatorship, Democracy, and Development." *The American Political Science Review*, 87(3), 567-576.
- Öniş, Z. (1991) "The Logic of the Developmental State", *Comparative Politics*, 24(1), 109–26.
- Ortega y Gasset, J (1918), "Impresiones de un viajero", Hebe, 5.
- Ovadia, J. S. (2016a). "Local content policies and petro-development in Sub-Saharan Africa: A comparative analysis." *Resources Policy*, 49, 20-30.

- Ovadia, J.S. (2016b). *The Petro-Developmental State in Africa: Making Oil Work in Angola, Nigeria and the Gulf of Guinea*. London: Hurst Publishers.
- Overton, J. (1994) "Agriculture and Industry in Colonial Malaysia", in H. Brookfield (Ed.) *Transformation with Industrialization in Peninsular Malaysia*. Kuala Lumpur: Oxford University Press.
- Pack, H, and Saggi, K. (2006) "Is There a Case for Industrial Policy? A Critical Survey." *World Bank Research Observer* 21(2), 267–97.
- Palma, J. G. (2010). "Why has productivity growth stagnated in most Latin-American countries since the neo-liberal reforms?" (Revised 26-07-2011) Working paper No. 1030. Faculty of Economics, University of Cambridge.
- Palma, J. G. (2014). "De-industrialisation, 'premature' de-industrialisation and the dutch-disease". *Revista NECAT-Revista do Núcleo de Estudos de Economia Catarinense*, 3(5), 7-23.
- Parrado, E. (2016) "Lecture notes", *Course on 'Reversing the Resource Curse: Theory and Practices'*, Budapest, 20 April.
- Pek Chen, G. (1999) "The semiconductor industry in Malaysia", in Jomo, K.S., Felker, G. & Rasiah, R. (Eds): *Industrial Technology Development in Malaysia: Industry and Firm Studies*, New York: Routledge. 125-149.
- Perez, C. (2008). "A Vision for Latin America: A resource-based strategy for technological dynamism and social inclusion," *Globelics Working Paper Series*, Retrieved from <https://ideas.repec.org/p/aal/glowps/2008-01.html>
- Perez, C., Marin, A. and Navas-Aleman L. (2014) "The possible dynamic role of natural resource-based networks in Latin American development strategies" in Dutrénit, G. and J. Sutz (eds), *Innovation Systems For Inclusive Development: The Latin American Experience*, Cheltenham: Edward Elgar.
- Petrie, M. (2010) "Promoting Public Investment Efficiency: a Synthesis of Country Experiences", *Paper presented at the World Bank Workshop 'Promoting Public Investment Efficiency; Global Lessons and Resources for Strengthening World Bank Support for Client Countries'*, Washington DC, July 7.
- Pietrobelli, C. and C. Staritz (2018) "Upgrading, Interactive Learning, and Innovation Systems in Value Chain Interventions", *The European Journal of Development Research* 30(3), 557–74.
- Pineda, J., and Rodríguez, F. (2010). *Curse Or Blessing?: Natural Resources and Human Development*. New York: United Nations Development Programme.
- Pinheiro F., Alshamsi A., Hartmann D., Boschma R. and C. Hidalgo (2018). "Shooting Low or High: Do Countries Benefit from Entering Unrelated Activities?", *Papers*

in Evolutionary Economic Geography July 18th, Utrecht. Utrecht University, Urban and Regional Research centre.

Piyanit O. (2010). *Competitive Challenges and Cluster Response: Orchids, Cars and Electronics in East and Southeast Asia*. Bangkok: Aboyz.

Porter, M. E. (1990) *The Competitive Advantage of Nations*. New York: Free Press.

Prebisch, R. (1950) *The Economic Development of Latin America and Its Principal Problems*, United Nations Economic Commission for Latin America and the Caribbean (ECLAC): New York.

Prichard, W., Salardi, P. and Segal, P. (2018). "Taxation, non-tax revenue and democracy: New evidence using new cross-country data," *World Development*, 109(C), 295-312.

Pritchett, L. (2000) "The Tyranny of Concepts: CUDIE (Cumulated, Depreciated, Investment Effort) Is Not Capital", *Journal of Economic Growth*, 5, 361–384.

Radetzki, M. (1977). "Where should developing countries' minerals be processed? The country view versus the multinational company view", *World Development*, 5(4), 325-334.

Rajaram, A. ; Tuan, M,L. ; Kai K. , Jay-Hyung K. and Jonas F. , Eds. (2014). *The Power of Public Investment Management: Transforming Resources into Assets for Growth*. Washington, DC: World Bank

Rali, M.N. (1999). "Supplier development in the Malaysian automotive industry: current practices, outcomes and issues", *Jurnal Produktiviti*, 17 (January), 1–29.

Ramachandran, V. & Shah, M. J. (1999). "Minority Entrepreneurs and Private Sector Growth in Sub-Saharan Africa" *World Bank Discussion Paper No. 86*, Washington, DC: World Bank.

Ramos, J. (1998). "A Development Strategy Founded on Natural Resource-Based Production Clusters". *CEPAL Review n.66*, Santiago: ECLAC.

Rasiah, R. (1987). "Production in Transition within the Semiconductor Industry and its Impact on Penang". *Kajian Malaysia*, 6(1), 45-64.

Rasiah, R. (1988). "The semiconductor industry in Penang: Implications for the new international division of labour theories" *Journal of Contemporary Asia*, 18(1), 24-46.

Rasiah, R. (1995). *Foreign Capital and Industrialization in Malaysia*, Palgrave Macmillan, London.

Rasiah, R. (2004). *Foreign Firms, Technological Capabilities and Economic*

Performance: Evidence from Africa, Asia and Latin America. Cheltenham: Edward Elgar.

Rasiah, R. (2005). "Trade-related investment liberalization: the Malaysian experience", *Global Economic Review*, 34(4), 453–471.

Rasiah, R., (2006). "Explaining Malaysia's Export Expansion in Palm Oil and Related Products," in V. Chandra (ed) *Technology, Adaptation, and Exports: How Some Developing Countries Got it Right*. Washington D.C.: World Bank.

Rasiah, R. (2010). "Are electronics firms in Malaysia catching up in the technology ladder?", *Journal of Asia Pacific Economy*, 15(3): 301-19.

Rasiah, R. (2017). "The industrial policy experience of the electronics industry in Malaysia", in Page, J., & Tarp, F. (Eds.) *The Practice of Industrial Policy: Government—Business Coordination in Africa and East Asia*. Oxford University Press.

Rasiah, R. and Chandran V.G.R. (2015). "Malaysia", in UNESCO (ed), *Science Report: towards 2030*. Paris: UNESCO.

Rasiah, R and Shahrin, A (2006). *Development of Palm Oil and Related Products in Malaysia and Indonesia*. University of Malaysia. 1-54.

Rasiah, R., & Shari, I. (2001). "Market, government and Malaysia's new economic policy". *Cambridge Journal of Economics*, 25(1), 57-78.

Reinert, E. S. (2007). *How Rich Countries Got Rich--and why Poor Countries Stay Poor*. Public Affairs.

Retamales, J. B., Palma, M. J., Morales, Y. A., Lobos, G. A., Moggia, C. E., & Mena, C. A. (2014). "Blueberry production in Chile: current status and future developments". *Revista Brasileira de Fruticultura*, 36(1), 58-67.

Richard, D.G. (1997) "The Political Economy of the Chilean Miracle", *Latin American Research Review* 31(1): 139–59.

Robinson, J.A. and Torvik, R. (2005). "White elephants", *Journal of Public Economics* 89, 197- 210.

Rodrik, D. (2004) *Industrial Policy for the Twenty-first Century*. Cambridge, MA: John F. Kennedy School of Government

Rodrik, D. (2007). *One economics, many recipes: Globalization, institutions, and economic growth*. Princeton: Princeton University Press.

Rodrik, D. (2008). "Normalizing industrial policy". Commission on Growth and Development. *Working Paper No. 3*. Washington, DC: The International Bank for

- Roe, A., & Dodd, S. (2018). "Dependence on Extractive Industries in low-income countries: Statistical tendencies", in Addison A. and A. Roe (eds) *Extractive Industries: The Management of Resources As a Driver of Sustainable Development*, 33-70. Oxford University Press.
- Rosenberg, N, (1976) *Perspectives on Technology*, New York: Cambridge University Press.
- Rosli, M. M. (2004) *Entrepreneurship, economic organization and the automobile industry: a study of the Asian model and Malaysia Experience*. Ph.D. thesis, Kuala Lumpur: University of Malaya,
- Rosli, M. and Kari, F. (2008) "Malaysia's National Automotive Policy and the Performance of Proton's Foreign and Local Vendors", *Asia Pacific Business Review*, 14:1, 103-118.
- Ross, M. (1999) "The Political Economy of Resource Curse", *World Politics*, 51 (January), 297-322.
- Ross, M. (2012). *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations*. Princeton University Press.
- Rossi, I. (1995) "Desarrollo y Competitividad del Sector Forestal-Maderero" [Development and Competitiveness in the Forestry-Wood sector], in P. Meller and R. Sáez (eds) *Auge Exportador Chileno: Lecciones y Desafíos Futuros*, [Chile's export boom: lessons and future challenges], 109-135. Santiago: Dolmen and CIEPLAN.
- Routley, L. (2012) "Developmental States: A Review of the Literature". *ESID Working Paper (3)*. Manchester: Effective States and Inclusive Development.
- Rowthorn, R., & Ramaswamy, R. (1999). "Growth, trade, and deindustrialization", *IMF Staff papers*, 46(1), 18-41.
- Ruiz-Dana, A. (2007). *Commodity Revenue Management: The case of Chile's copper boom*. Winnipeg: International Institute for Sustainable Development.
- Saad-Filho, A., & Weeks, J. (2013). "Curses, diseases and other resource confusions". *Third World Quarterly*, 34(1), 1-21
- Sachs, J.D. and A.M. Warner (1995) "Natural Resource Abundance and Economic Growth", *National Bureau of Economic Research*, Working Paper 5398 (December).
- Sachs, J.D., & Warner, A.M. (1997). "Natural resource abundance and economic growth". In G. Meier, & J. Rauch (Eds.) *Leading issues in economic development*. Oxford, UK: Oxford University Press.

- Sachs, J. D., & Warner, A. M. (2001). "The curse of natural resources". *European Economic Review*, 45, 827-838.
- Sachs, J.D. (2007). "How to Handle the Macroeconomics of Oil Wealth?" in M.Humphreys, J.D. Sachs, and J.E. Stiglitz (eds.) *Escaping the Resource Curse*. 173-194. New York: Columbia University Press.
- Saham, J. (1980). *British Investment in Malaysia, 1963-1971*. Kuala Lumpur: Oxford University Press.
- Salazar-Xirinachs J.M.; Nübler, I. and Kozul-Wright, R. (2014). *Transforming Economies: Making Industrial Policy Work For Growth, Jobs And Development*, Geneva: International Labour Organization.
- Salleh, I., & D. Meyanathan, S. (1993). *Malaysia: growth, equity, and structural transformation*. The World Bank.
- SalmonChile (2009) *Exportaciones Chilenas de Salmon y Trucha en Toneladas [Chilean Exports of Salmon and Trouts in Tons]*. Santiago: SalmonChile.
- SalmonChile (2018) *Summary of Exports*, Retrieved from: https://www.salmonchile.cl/assets/uploads/2019/03/resumen_exportaciones.pdf [Accessed 12 December 2018].
- Sani, M.S.M.; Zahari S. N.; Azmi, N.I.M. and Musa, S. (2015) "Secret to Success: Securing Petronas Vendor Development Program (VDP)" *Paper presented at the International Conference on Knowledge Transfer*, 1-3 December, Putrajaya, Malaysia.
- Sarbu, B. (2014). *Ownership and Control of Oil: Explaining Policy Choices across Producing Countries*. New-York: Routledge.
- Sawal, A.H. (2001) "The Malaysian Rubber Industry: Meeting New Challenges and Moving Ahead" in *MRPMA Industry and Export Directory 2002-2003*. Subang Jaya, Malaysia: MRPMA, 106-14.
- Schmitz, J. & Platts, K. W. (2003) "Roles of supplier performance measurement: indication from a study in the automotive industry", *Management Decision*, 41(8), 711-721.
- Schumpeter, J.A. (1942) *Capitalism, Socialism, and Democracy*. New York: Harper.
- Schurman, R. A. (1996). "Chile's new entrepreneurs and the "economic miracle": The invisible hand or a hand from the state?". *Studies in Comparative International Development*, 31(2), 83-109.
- Selwyn, B. (2015). "Commodity chains, creative destruction and global inequality: a class analysis", *Journal of Economic Geography*, 15(2015), 253-274.

- Shailer, G. (2004) *An Introduction to Corporate Governance in Australia*, Sydney: Pearson Education Australia
- Sid Ahmed, A. (1989), *Economie de L'industrialisation a Partir des Ressources Naturelles*. Alger: OPU.
- Singer, H. W. (1950). The distribution of gains between investing and borrowing countries. *The American Economic Review*, 40(2), 473-485.
- Singh, I & Evans, J. (2009), "Natural resource-based sustainable development using a cluster approach", in Richards, J (ed.) *Mining, Society, and a Sustainable World*, 183-201. Berlin Heidelberg: Springer.
- Solimano, A. (2012) *Chile and the Neoliberal Trap: The Post-Pinochet Era*. Cambridge: Cambridge University Press.
- Solimano, A. and Guajardo, D. Calderón (2017) "The copper sector, fiscal rules, and stabilization funds in Chile: Scope and limits". *WIDER Working Paper 2017/53*. Helsinki: UNU-WIDER.
- Siew Yean, T. (2015) "Diversification and industrial policies in Malaysia" in Felipe, J. (Ed.). (2015). *Development and modern industrial policy in practice: issues and country experiences*. 320-345. Edward Elgar Publishing.
- Spengler, J.J. (1960), "Mercantilist and physiocratic theory", in Hoselitz (ed.) *Theories of economic growth*, 3-64. Free Press.
- Stevens, P. (2015). "The Resource Curse Revisited—Appendix A Literature Review". London: Chatham House. Retrieved from: https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20150804ResourceCurseRevisitedStevensLahn_KooroshyAppendix.pdf. [Accessed 13 February 2019].
- Stevens, P., G. Lahn, and J. Korooshy (2015). "The Resource Curse Revisited", *EER Report*. London: Chatham House.
- Stiglitz, J. (2003) "Covering Resource Wealth". *Presentation at the Initiative for Policy Dialogue/Public Finance Monitor Center Workshop*, 20 November, Baku, Azerbaijan. Retrieved from: <http://www2.gsb.columbia.edu/ipd/bakutranscript.pdf>
- Subramanian, M. A., & Sala-i-Martin, X. (2003). *Addressing the natural resource curse: An illustration from Nigeria* Washington D.C.: International Monetary Fund.
- Subramaniam, V. & Yuen May, C. & Muhamad, H., & Hashim, Z. & Ai Tan, Y. & Chiew Wei, P. (2010) "Life Cycle Assesment of The Production Of Crude Palm Oil (part 3)", *Journal of Oil Palm Research*, 22 (December), 895-903.

- Succar, P. (1987). "The Need for Industrial Policy in LDCs—A Restatement of the Infant Industry Argument." *International Economic Review*, 28(2), 521–34.
- Takizawa, H., E. H. Gardner, and K. Ueda, (2004), "Are Developing Countries Better Off Spending Their Oil Wealth Upfront?" *IMF Working Paper WP/04/141*. Washington DC: IMF.
- Tai, W. P., & Ku, S. (2013). "State and Industrial Policy: Comparative Political Economic Analysis of Automotive Industrial Policies in Malaysia and Thailand". *Journal of ASEAN Studies*, 1(1), 52-82.
- Tan, L.L. (2008). *The internationalisation of Malaysian manufacturing small and medium enterprises*. DBA thesis, Southern Cross University, Lismore, NSW.
- Tat Wai, T. (1988) "Management of Resource-Based Growth in Different Factor Endowment Conditions" in Urrutia and Setsuko Yukawa (eds), *Economic development policies in resource rich countries*, Hong Kong: The United Nations University.
- Thoburn, J. T. (1973) "Exports and Economic Growth in West Malaysia", *Oxford Economic Papers*, (25), 88-111.
- Thoburn, J. T. (1977) *Primary Commodity Exports and Economic Development: Theory, Evidence and Case Study of West Malaysia*. London: John Wiley.
- Tinsman, H. (2013) *Buying into the Regime: Grapes and Consumption in Cold War Chile and the United States*. Durham, NC: Duke University Press.
- Tordo, S. and Anouti, Y. (2013) *Local Content in the Oil and Gas Sector: Case Studies*. Washington, D.C.: The World Bank.
- Tordo, S., Warner, M. Manzano, O.E. and Anouti, Y. (2013). *Local Content Policies in the Oil and Gas Sector*. Washington, DC: World Bank.
- Torri, T. (1991) "Changing the manufacturing sector, reorganizing automobile assemblers and developing the auto component industry under the new economic policy", *The Developing Economies*, 29(4), 387–413.
- Torvik, R. (2011) "The Political Economy of Reform in Resource-Rich Countries" in Arezki, R; T. Gylfason, and A. Sy (eds.) (2011) *Beyond the Curse: Policies to harness the power of natural resources*, Washington D.C.: IMF.
- Tornell, A., & Lane, P. R. (1999). "The voracity effect". *American economic review*, 89(1), 22-46.
- Transparency International (2017) *Mining for sustainable development*, Retrieved from: http://transparency.org.au/tia/wpcontent/uploads/2017/11/M4SD_CaseStudy1_RevolvingDoors.pdf [Accessed 13 October 2017].

- Truman, E.M. (2011). "Sovereign Wealth Funds: Is Asia Different?", *Working Paper 11-12*, Washington D.C.: Peterson Institute.
- UNCTAD (2003). *World Investment Report 2004: The Shift Towards Services*. New York and Geneva: United Nations.
- UNCTAD (2006a), "Boosting Africa's Growth through Re-Injecting 'Surplus' Oil Revenue: an Alternative to the Traditional Advice to Save and Stabilize," *Technical Report*. Geneva: UNCTAD.
- UNCTAD (2006b) "A Case Study of the Salmon Industry in Chile, Transfer of Technology", *United Nations Publication UNCTAD/ITE/IIT/2005/12*, New-York and Geneva: United Nations.
- UNCTAD (2019) *State of Commodity Dependence 2019*, Geneva: United Nations Publications.
- UNDP (2016) "Human Development Report 2016: Human development for everyone", *Country Explanatory Notes (Chile)*, New York and Geneva: United Nations.
- UNIDO (1991) *Malaysia: Sustaining the Industrial Investment Momentum*, Vienna: United Nations Industrial Development Organization.
- UNIDO (2012) *Promoting Industrial Diversification in Resource Intensive Economies: The Experiences of Sub-Saharan Africa and Central Asia Regions*, Vienna: United Nations Industrial Development Organization.
- Urzúa, O. (2011). *The Emergence and Development of Knowledge Intensive Mining Service Suppliers in the Late 20th Century*. Doctoral dissertation. University of Sussex, United Kingdom.
- Urzúa, O. (2012) "Emergence and Development of Knowledge-Intensive Mining Services (KIMS)". *Working Papers in Technology Governance and Economic Dynamics (41)*.
- US Department of State, (2001), "Country Commercial Guide: Malaysia", retrieved from: http://www.state.gov/www/about_state/business/com_guides/2001/eap/malaysia_ccg2001.pdf. [Accessed 13 June 2017].
- US Department of State (2011), "2011 Investment Climate Statement: Malaysia", *Bureau of Economic, Energy and Business Affairs*, retrieved from: <https://www.state.gov/e/eb/rls/othr/ics/2011/157318.htm> [Accessed 13 June 2017].
- U.S. Geological Survey (2019), *Mineral Commodity Summaries*, retrieved from: <https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/mcs-2019-coppe.pdf> [Accessed 27 January 2017].
- USAID (1962) "The Foreign Assistance Programme". *Annual Report to the Congress*.

Washington, DC: US Government Printing Office.

- van der Ploeg, F. and S. Poelhekke (2008). “Volatility, financial development and the natural resource curse”, *Oxcarre Research Paper 2008-03*, Oxford: University of Oxford.
- van der Ploeg, F. (2010). “Why Do Many Resource-Rich Countries Have Negative Genuine Savings? Anticipation of Better Times or Rapacious Rent Seeking,” *Resource and Energy Economies*, 32, 28-44.
- van der Ploeg, F., and A.J. Venables. (2010). “Absorbing a Windfall of Foreign Exchange: Dutch Disease Dynamics.” *OxCarre Research Paper*, (52). Oxford: University of Oxford.
- van der Ploeg, F. and Anthony J. Venables, (2011). “Harnessing Windfall Revenues: Optimal Policies for Resource-Rich Developing Economies,” *The Economic Journal*, 121(551), 1-30.
- Van Wijnbergen, S. (1984). “The Dutch Disease’: a disease after all?”. *The Economic Journal*, 94(373), 41-55.
- Varas, M.E. (2012) *Economic Diversification: The Case of Chile*. New York: Revenue Watch Institute.
- Venables, A.J., (2010). “Resource Rents; When to Spend and How to Save,” *International Tax and Public Finance*, 17, 340-356.
- Villafuerte, M. ; R. Ossowski ; T. Thomas and P.A. Medas (2008). “Managing the Oil Revenue Boom: the Role of Fiscal Institutions” *Occasional Paper No. 260*. Washington, D.C.: International Monetary Fund
- Viner, J. (1952) *International Trade and Economic Development*, Glencoe, Illinois: The Free Press.
- Wad, P. (2010) “Impact of the global economic and financial crisis over the automotive industry in developing countries”, *Working Paper 16*, Vienna: UNIDO.
- Wad, P. and Govindaraju, V.G.R.C. (2011) “Automotive industry in Malaysia: an assessment of its development”, *Int. J. Automotive Technology and Management*, 11(2), 152–171.
- Wade, R. (1990) *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization*. Princeton, NJ: Princeton University Press.
- Wahid, M.B., Weng, C.K. and Masri, R. (2007). “Palm Oil: Nature’s Gift to Malaysia and Malaysia’s Gift to the World”, *paper presented at the 2007 Conference on Plantation Commodities on “Visionary Agriculture: Malaysian Commodity Crops*

in 100 years”, Ministry of Plantation Industries and Commodities, 3-4 July 2007, Kuala Lumpur.

Watkins, M. H. (1963). “A staple theory of economic growth”, *The Canadian Journal of Economics and Political Science*, 29(2), 141-158.

Wee C.H. (2008) “Oil and Gas in Federal System: the case for Malaysia”, *Paper presented at the Oil and Gas in Federal System conference*, Forum of Federation, Canada, October 10th.

Werner, M., Bair, J., & Fernández, V. R. (2014). “Linking up to development? Global value chains and the making of a post-Washington Consensus”. *Development and Change*, 45(6), 1219-1247.

Wheelwright, E.L. (1965) *Industrialization in Malaysia*, Melbourne University Press: London.

Witter, S. and Jakobsen, M. (2018) “Choices for Spending Government Revenue: New African Oil, Gas, and Mining Economies” in Addison T. and Roe, A. (eds) *Extractive Industries: The Management of Resources as a Driver of Sustainable Development*. 547-567. Oxford University Press.

Woo-Cumings, M. (ed.) (1999) *The Developmental State*. Ithaca, NY: Cornell University Press.

World Bank (1989) *Malaysia: Matching risks and rewards in a mixed economy*. Washington D.C.: The World Bank.

World Bank (1993) “Malaysia Second Rubber Industry Smallholders Development Authority (RISDA) Project”, *Staff Appraisal Report*, retrieved from: <http://documents.worldbank.org/curated/en/347931468278967761/pdf/multi0page.pdf> [Last accessed 10 September 2018]

World Bank (2007). *Investing in Oil in the Middle East and North Africa: Institutions, Incentives and the National Oil Companies*. Washington, DC: World Bank.

World Bank (2010). “Ecuador: Diversification and Sustainable Growth In an Oil-Dependent Country”, *Report No. 46551-EC*. Washington D.C.: The World Bank.

World Bank. (2011b). *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*. Washington, D.C.: World Bank.

World Bank (2013), “Malaysia Economic Monitor: Harnessing Natural Resources” *World Bank Office*, Retrieved from: http://www.worldbank.org/content/dam/Worldbank/document/EAP/malaysia/Malaysia_Economic_Monitor_June2013.pdf [Accessed 12 March 2019]

World Bank (2016) *Algerie*. Retrieved from:

<http://pubdocs.worldbank.org/pubdocs/publicdoc/2016/4/90791460465174473/Algeria-MEM-FR.pdf> [Accessed 12 February 2019]

- World Economic Forum (2018) *Thinking Strategically: Using Resource Revenues to Invest in a Sustainable Future*. Geneva: World Economic Forum.
- Wright, G., & Czelusta, J. (2004). "Why Economies Slow: The myth of the Resource Curse". *Challenge*, 47(2), 6-38.
- Yeoh, T. (2008), "Promoting Revenue Transparency in Malaysia", *Centre for Public Policy Studies*, July 23, Retrieved from: <http://cpps.org.my/publications/promoting-revenue-transparency-in-malaysia/>
- Yusof, Z.A. (2007). "The Malaysian Economic Model: A case of heterodoxy", in Nungsari, A.R. and Suryani, S.A. (eds.) *Readings on Development: Malaysia 2057: Uncommon Voices, Common Aspirations*. Kuala Lumpur: Khazanah Nasional.
- Yusuf, S. and K. Nabeshima (2009). *Tigers under Threat: The Search for a New Growth Strategy by Malaysia and its Southeast Asian Neighbours*, Washington, DC: World Bank.

Newspaper and online media

- AFP (2011). “Chile: Pollution and gas leak hit community”, March 30, Retrieved from: <http://www.minesandcommunities.org/article.php?a=10827> [Accessed 26 June 2018]
- Alsagoff, S.S. (2015). “Go global: Petronas’ vendor development programme” *The Oil and Gas Year*, Retrieved from: <https://www.theoilandgasyear.com/articles/go-global-petronas-vendor-development-programme/> [Accessed 23 March 2018]
- Ananthalakshmi, A. (2017). “Petronas Chemicals looks to boost specialty chemical sales”, May 16, *Reuters*, Retrieved from: <https://www.reuters.com/article/us-malaysia-petronas-petronas-chems/petronas-chemicals-looks-to-boost-specialty-chemicals-sales-idUSKCN18C15W> [Accessed 21 October 2018]
- Anyanzwa, J. (2017) Congo-Kinshasa: Resource-Rich DRC Losing U.S.\$1.3 Billion Every Year in Unpaid Taxes. *All Africa*. 6 September 2017. Retrieved from: <https://allafrica.com/stories/201709070077.html> [Accessed 13 February 2019]
- Augustin, R (2017), “Palm oil board refutes economist’s claim on biodiesel”, March 29, *Free Malaysia Today*, Retrieved from: <http://www.freemalaysiatoday.com/category/nation/2017/03/29/palm-oil-board-refutes-economists-claim-on-biodiesel/> [Accessed 21 September 2018]
- Australian Trade and Investment Commission (2016) “Expomin, Santiago, Chile”, Retrieved from: https://www.austrade.gov.au/EventViewBookingDetails.aspx?Bck=Y&EventID=14240#/event?_k=tvguin [Accessed 21 September 2018]
- Australian Trade and Investment Commission (2017), “Mining to Chile: Trends and opportunities”, Retrieved from: <https://www.austrade.gov.au/Australian/Export/Export-markets/Countries/Chile/Industries/mining> [Accessed 21 September 2018]
- Azzopardi, T. (2011). “Adding value to copper”, *Business Chile Magazine*, November 24, Retrieved from: <https://www.amchamchile.cl/en/2011/11/anadir-valor-al-cobre/> [Accessed 13 October 2017].
- Bauer, A. (2015) *Six Reasons Why Sovereign Wealth Funds Should Not Invest or Spend at Home*, Retrieved from: <http://www.resourcegovernance.org/blog/six-reasons-why-sovereign-wealth-funds-should-not-invest-or-spend-home-0>. [Accessed 11 October 2016].
- Bell, T. (2016). “The largest copper smelters: A look at the biggest copper refiners”, November 21, *The Balance*, Retrieved from: <https://www.thebalance.com/the-20-largest-copper-refineries-2339744> [Accessed 1 November 2017].

- Boulding, W. & M. Christen (2001). "First-Mover Disadvantage", *Harvard Business Review*, Retrieved from: <https://hbr.org/2001/10/first-mover-disadvantage>. [Accessed 21 March 2018]
- Bridges, T. (1987) "Chile Cuts \$2.3 Billion of Red Ink by Turning Debt into Investment", *The Christian Science Monitor*, 10 December, <https://www.csmonitor.com/1987/1210/fdebt.html> [Accessed 21 November 2018]
- Cheong H. (2011) "National Automotive Policy Report Card", *New Straits Times*, 29 June.
- EIA (2018). "Crude oil prices increased in 2016, still below 2015 average", *US Energy Information Administration*. Retrieved from: <https://www.eia.gov/todayinenergy/detail.php?id=29412> [Accessed 22 February 2019]
- EITI (2013). "Burkina Faso", Retrieved from: <https://eiti.org/report/burkina-faso/2013> [accessed 29 January 2019]
- EITI (2016). "Sitting on a gold mine", Retrieved from: <https://eiti.org/news/sitting-on-gold-mine> [accessed 29 January 2019]
- EITI (2018a). "Burkina Faso- Revenue collection", Retrieved from: <https://eiti.org/burkina-faso#revenue-collection> [accessed 29 January 2019]
- EITI (2019) "Democratic Republic of Congo". Retrieved from: <https://eiti.org/democratic-republic-of-congo> [accessed 29 January 2019]
- European Parliament (2018). "MPs set ambitious targets for cleaner, more efficient energy use" *Press releases*, January 17, Retrieved from: <http://www.europarl.europa.eu/news/en/press-room/20180112IPR91629/meps-set-ambitious-targets-for-cleaner-more-efficient-energy-use> [Accessed 21 September 2018]
- Financial Times (2014) "Chile Rethinks its Free Market Experiment", *Financial Times* 7 December. Retrieved from: www.ft.com/content/97dce28e-7b18-11e4-87d4-00144feabdc0 [accessed 28 March 2019].
- Financial Tribune (2018) "Share of Oil in Iran's General Revenues Falls From 46% to 34% in 6 Years", March 03, Retrieved from: <https://financialtribune.com/articles/domestic-economy/82881/share-of-oil-in-irans-general-revenues-falls-from-46-to-34-in-6-yrs> [Accessed 8 February 2019]
- Fong C.O. (2011). "Burden or catalyst?", *Sunday Star*, 1 May.
- Fortune (2018), "Petronas", *Global 500*, Retrieved from: <http://fortune.com/global500/petronas/> [Accessed 23 September 2018]
- Friedman, M. (1982) "Free markets and the generals", *Newsweek*, 25 January, p. 59.

- Guerra, P. (2013), “Chile's Madeco stops manufacturing copper tubes”, December 17, *BN Americas*, Retrieved from: <https://www.bnamericas.com/en/news/metals/madeco-stops-manufacturing-copper-tubes/> [Accessed 26 September 2017].
- Hallas, L. (2018) “Soutien à l’emploi de jeunes: 10% de crédits Ansej non remboursés” *Le Soir d’Algerie*, May 14, Retrieved from: <https://www.lesoirdalgerie.com/actualites/10-de-credits-ansej-non-rembourses-5018> [Accessed August 18]
- Hantrais, L. (1995) Comparative Research Methods, *Social Research Update*. Department of Sociology, University of Surrey, Retrieved from: <http://sru.soc.surrey.ac.uk/SRU13.html> [accessed 31 March 2019].
- International Forum of Sovereign Wealth Funds (2018) “Botswana - Pula Fund”, Retrieved from: www.ifswf.org/file/821/download?token=GoNe5ggo [Accessed August 15].
- Jewell, A. (2016) “The Need for Subsidy Reform in Algeria”, *IMF Blog*, Retrieved from: <https://www.imf.org/external/np/blog/nafta/083116.pdf> [Accessed 15 September 2018]
- Jusko, J. (2008) “R&D spending: by the numbers”, *IndustryWeek*, December 10th, Retrieved from: <https://www.industryweek.com/research-amp-development/rd-spending-numbers> [Accessed 15 August 2019].
- Khazanah Nasional (2017). “Our Investments”, Retrieved from: <https://www.khazanah.com.my/Our-Investments/Overview> [Accessed 25 November 2018]
- Le Matin d’Algérie (2017). “Le Fonds de régulation des recettes épuisé depuis février”, September 8th, *Le Matin d’Algérie*, Retrieved from: <http://www.lematindz.net/news/25295-les-fonds-de-regulation-des-recettes-epuise-depuis-fevrier.html> [Accessed August 18]
- Liau Y-S. (2012) “Condoms, Gloves Provide Lifeline for Malaysian Rubber”, *Bloomberg*, November 19, Retrieved from: <https://www.bloomberg.com/news/articles/2012-11-18/condoms-gloves-provide-lifeline-for-malaysian-rubber> [Accessed 17 September 2018].
- May, C.Y. (2012), “Economic transformation advances oil palm industry”, *The American Oil Chemist Society*, September, Retrieved from: <https://www.aocs.org/stay-informed/read-inform/featured-articles/malaysia-economic-transformation-advances-oil-palm-industry-september-2012> [Accessed 17 September 2018].
- Mineria Chilena (2014). “INCuBA de Codelco: Nuevos usos del cobre para diversificar los mercados” [*Codelco’s INCuBA: New uses of copper to diversify markets*], June, 10, Retrieved from: <http://www.mch.cl/reportajes/incuba-de-codelco-nuevos-usos-del-cobre-para-diversificar-los-mercados/> [Accessed 17 September 2017].

- Monk, A. (2013). "The Rise of Sovereign Development Funds." *Institutional Investor*. Retrieved from: <http://www.institutionalinvestor.com/blogarticle/3189172/Blog/The-Rise-of-Sovereign-Development-Funds.html> [Accessed 18 July 2019].
- Norsk Petroleum (2018) *The Government's Revenues*, Retrieved from: <https://www.norskpetroleum.no/en/economy/governments-revenues/> [Accessed 10 February 2019]
- Norwegian Petroleum Directorate (2010) *Government Petroleum Revenues*. Retrieved from: <http://www.npd.no/Global/Engelsk/3%20%20Publications/Facts/Facts2010/Chapter/Chapter-3.pdf> [Accessed 12 February 2019].
- Nueva Minería y Energía (2013), "Madeco discontinued production of copper tubes", December, 19, Retrieved from: <http://www.nuevamineria.com/revista/madeco-discontinued-production-of-copper-tubes/> [Accessed 29 October 2017].
- NST (2017). "Celebrating 100 years of Malaysian palm oil (Part 1)", *New Straits Times* (19 May 2017), Retrieved from: <https://www.nst.com.my/news/nation/2017/05/240770/celebrating-100-years-malaysian-palm-oil-part-1> [Accessed 29 October 2017].
- Petronas (2012) "Petronas Group: Financial Results Announcement", Retrieved from: <http://www.petronas.com.my/investor-relations/Documents/financial-operational-review/Third%20Quarter%20Ended%2031%20December%202011.pdf> [Accessed 29 October 2017].
- Petronas (2013), "Petronas appoints three new vendors", November 20, Retrieved from: <http://www.petronas.com.my/media-relations/media-releases/Pages/article/PETRONAS-APPOINTS-THREE-NEW-VENDORS.aspx> [Accessed 29 October 2017].
- Petronas (2016), "Licensing and Registration Frequently Asked Question: October 2016", Retrieved from: <http://www.petronas.com.my/partnering-us/licensing-registration/Documents/FAQ%20New%20Entries.pdf> [Accessed 19 July 2017].
- Petronas, (2017a), "Petronas Upstream: Pursuing Value-Driven Growth", Retrieved from: http://www.petronas.com.my/our-business/Upstream/Documents/November%202017_Upstream%20Brochure%20%28compressed%29.pdf [Accessed 29 October 2017].
- Petronas (2017b) "Petrochemicals", Retrieved from: <http://www.petronas.com.my/our-business/downstream/refinery-petrochemicals/Pages/Petrochemicalshome.aspx> [Accessed 29 March 2018].
- Petronas Chemicals Group (2017) "Website of the Petronas Chemicals Group" Retrieved from: <http://www.petronaschemicals.com.my/Pages/default.aspx> [Accessed 29 March 2018].

- Philips, D. (2015), "Samarco dam collapse: one year on from Brazil's worst environmental disaster", *The Guardian* October, 15, Retrieved from: <https://www.theguardian.com/sustainable-business/2016/oct/15/samarco-dam-collapse-brazil-worst-environmental-disaster-bhp-billiton-vale-mining> [Accessed 11 December 2017].
- Shirley, C (1988) "International Report: Chile's Debt-Swap Plan Cuts Loans by \$4 Billion", *The New York Times* 18 July. Retrieved from: www.nytimes.com/1988/07/18/business/international-report-chile-s-debt-swap-plan-cuts-loans-by-4-billion.html [Accessed 20 March 2018].
- Slattery, G. (2017) "S&P downgrades Chile sovereign debt for first time in decades", *Reuters*, July 13, Retrieved from: <https://www.reuters.com/article/chile-ratings/sp-downgrades-chile-sovereign-debt-for-first-time-in-decades-idUSL1N1K4278> [Accessed 15 July 2018]
- Tay, C. (2018) "Petronas Launches New Vendor Development Programme", *The Edge Markets*, Retrieved from: <http://www.theedgemarkets.com/article/petronas-launches-new-vendor-development-programme> [Accessed 21 September 2018]
- Thayoob A.M.D. (2018) "Forewords for the Asia Petrochemical Industry Conference", August, 21-28, Kuala Lumpur, Retrieved from: <http://apic2018.org.my/forewords.php> [Accessed 21 September 2018].
- The Edge, (2013) "Petronas Vendor Development Program (VDP) helped Bumi Firms to Compete Globally", December 5, Retrieved from: <http://www.theedgemarkets.com/article/petronas-vdp-stepping-stone-bumi-firms-compete-globally> [Accessed 23 June 2018].
- The Star, (2009). "Barter Trade to the Rescue", February 17th, accessible on <https://www.thestar.com.my/business/business-news/2009/02/17/barter-trade-to-the-rescue/#IdWXjyHL3V1jTJZI.99> [Accessed 23 June 2018]
- This Is Chile Foundation (2011). "Chilean copper fibre socks used by 'Los 33' released for sale", 25 March, Retrieved from: <https://www.thisischile.cl/chilean-copper-fibre-socks-used-by-los-33-released-for-sale/?lang=en> [Accessed 13 December 2018]
- TraningMag (2018) "Training industry report 2018" Retrieved from: <https://trainingmag.com/trgmag-article/2018-training-industry-report/> [Accessed 13 August 2019].
- Waters, L. (2016), "Ban donations from mining companies and stop ministers working for them", *The Guardian*, March, 01, Retrieved from: <https://www.theguardian.com/commentisfree/2016/mar/01/larissa-waters-ban-donations-from-mining-companies-and-stop-ministers-working-for-them> [Accessed 15 July 2018]

White House Archives (2012) “Fact Sheet: Sanctions Related to Iran” July 31, Retrieved from: <https://obamawhitehouse.archives.gov/the-press-office/2012/07/31/fact-sheet-sanctions-related-iran> [Accessed 1 August 2018]

Wong, S.H. (2013) “The Malaysian Electrical & Electronics (E&E) Industry – at an Inflexion point” *Jurutera*, 2017(13), 6-9.

Government documents (Chile and Malaysia)

COCHILCO (2009a) *Oportunidades de negocios para proveedores de bienes, insumos y servicios mineros en Chile [Business Opportunities for mining suppliers of goods and services in Chile]*. Santiago: COCHILCO

COCHILCO (2009b) *Con buenos yacimientos no alcanza: análisis y evolución de la productividad laboral en Chile [High abundance does not suffice: Analysis and evolution of labour productivity in Chile]*. Santiago: Dirección de Estudios y Políticas Públicas.

Malaysian Biofuel Industry Act, (2007) Rev. ed. Act 666. Attorney General's Chambers of Malaysia.

Malaysia Automotive Robotics and IoT Institute (2019). *The automotive industry*. Retrieved from: <http://marii.my/the-automotive-industry/>.

Malaysia External Trade Development Corporation (MATRADE) (2018) "Top ten exports for 2017", Retrieved from: <http://www.matrade.gov.my/en/malaysian-exporters/services-for-exporters/trade-market-information/trade-statistics/28-malaysian-exporters/trade-statistics/4149-top-10-major-export-products-2017> [Accessed on 19 March 2018].

Malaysian Government (1995), "Seventh Malaysian Plan 1996-2000", *Economic Planning Unit*, Retrieved from: <http://www.epu.gov.my/en/rmk/seventh-malaysia-plan-1996-2000> [Accessed on 14 July 2017].

Malaysian Palm Oil Board (MPOB), (2010), "Performance of the Malaysia Palm Oil Industry", Retrieved from: <http://bepi.mpob.gov.my/index.php/my/44-section/performance/123-performance-of-the-malaysia-palm-oil-industry-june-2010.html?fontstyle=f-larger> [Accessed on 11 March 2018].

Malaysian Institute of Economic Research- MIER (2006), "Rethinking the strategy for the manufacturing sector", Retrieved from: https://www.mier.org.my/newsarticles/archives/pdf/musalmah27_2_2006.pdf [Accessed on 14 September 2018].

Malaysian Rubber Board (2011) "Testing and Calibration", Retrieved from: <http://www.lgm.gov.my/testServices/ProductTest.aspx> [Accessed 22 June 2018]

Malaysian Rubber Board (2016) "Natural Rubber Statistics", Retrieved from: <http://www.lgm.gov.my/nrstat/nrstats.pdf> [Accessed 18 September 2018]

Malaysian Rubber Export Promotion Council (2018). "Industry Overview", Retrieved from: <http://www.mrepc.com/industry/industry.php> [Accessed 18 September 2018].

- MIDA (2008) *Performance of the Manufacturing and Service Sectors*, Retrieved from: http://www.mida.gov.my/home/administrator/system_files/modules/photo/uploads/20140126135224_Report.pdf [Accessed on 19 December 2017].
- MIDA (2016) *Profit From Malaysia's Petrochemical Industry*, Retrieved from: http://www.mida.gov.my/home/administrator/system_files/modules/photo/uploads/20160726143756_Petrochemical_Jun2016v5.pdf [Accessed 27 March 2018]
- MIDA (2017) *Malaysia: Investment in the Manufacturing sector: policies, incentives and facilities*, Kuala Lumpur: Malaysian Investment Development Authority.
- MIDA (2018a) "Industry News", *Newsletter*. 4(2018) (April). Retrieved from: http://www.mida.gov.my/home/administrator/system_files/modules/photo/uploads/20180601170355_MIDA%20NEWSLETTER%20April%202018%2001062018.pdf [Accessed 15 July 2019].
- MIDA (2018b) *Malaysia's Automotive Industry*. Kuala Lumpur: Malaysian Investment Development Authority
- MITI (2006) *Third Industrial Master Plan 2006-2020: Malaysia, towards global competitiveness*, Kuala Lumpur: Ministry of International Trade and Industry.
- MITI (2017), "Chemical and Petrochemical Industry", Retrieved from: http://www.miti.gov.my/miti/resources/1_Chemical_and_Petrochemical_Industry_.pdf [Accessed 27 November 2018]
- MITI (2018a) "The Electrical and Electronics Industry". Retrieved from: http://www.miti.gov.my/miti/resources/6_Electrical_and_Electronics_Industry_.pdf [Accessed 12 December 2018]
- MITI (2018b) *Updates on the Automotive Industry 2017 and Outlook in 2018*. Kuala Lumpur: Ministry of International Trade and Industry.
- Ministry of Finance of Chile (2018). *Economic and Social Stabilization fund*. Retrieved from: <https://www.hacienda.cl/english/sovereign-wealth-funds/economic-and-social-stabilization-fund.html> [Accessed 6 June 2019].
- Ministry of Plantation Industries and Commodities of Malaysia -MPIC (2006). *The National Biofuel Policy*. Kuala Lumpur: Ministry of Plantation Industry and Commodities.
- MPOB (2010), *Palm Biodiesel Environmental-friendly Fuel*. Bangi: Malaysian Palm Oil Board.
- MPRC (2017). *Corporate report 2017*. Retrieved from: https://www.mprc.gov.my/sites/default/files/resources/MPRC_CR18_COMPLETE_01.pdf. [Accessed 12 January 2019]
- MPRC (2018). *The Malaysia Oil & Gas Services and Equipment Catalogue 2018*.

Retrieved from: https://www.mprc.gov.my/sites/default/files/resources/MPRC_OGSE2018_Complete.pdf. [Accessed 12 January 2019]

National Economic Advisory Council, Malaysia (2010). *New Economic Model for Malaysia Part I*. Putrajaya: National Economic Advisory Council.

PEMANDU (2010). *Economic Transformation Programme: A roadmap for Malaysia*, Putrajaya: Performance Management and Delivery Unit.

PEMANDU (2012) *Economic Transformation Programme, Annual Report 2012*, Putrajaya: Performance Management and Delivery Unit.

Penang Development Corporation (1990) *Penang, looking back, looking ahead. 20 years of progress*. Penang: Penang Development Corporation.

Petroleum Development Act (1974), Commissioner Of Law Revision of Malaysia, Retrieved from: <http://www.agc.gov.my/agcportal/uploads/files/Publications/LOM/EN/Act%20144.pdf> [Accessed 12 April 2018]

Promotion of Investment Act - PIA (1986) Ministry of Finance of Malaysia, Retrieved from: <http://www.treasury.gov.my/index.php/en/tax/item/1160-promotion-of-investment-act-1986.html> [Accessed 12 April 2018]

Datasets and databases

Center for International Data (2018) *NBER-United Nations Trade Data 1962-2000*. Available at <https://cid.econ.ucdavis.edu/nberus.html> [Accessed 11 June 2018]

Chilean Copper Commission - COCHILCO (2010). *Yearbook: Copper and Other Mineral Statistics 1990—2009*, Available at <http://www.cochilco.cl/productos/descarga/anuarios/anuario2009.pdf> [accessed 23 October 2017]

CIA (2018) *The World Factbook* Available at: <https://www.cia.gov/library/publications/the-world-factbook/>.

Indxmundi (2018a) “Copper, grade A cathode Monthly Price - US Dollars per Metric Ton”, *Commodity Prices*. Available at: <https://www.indexmundi.com/commodities/?commodity=copper&months=360> [Accessed 12 February 2019]

Indxmundi (2018b) “Natural Gas Monthly Price - US Dollars per Million Metric British Thermal Unit”, *Commodity Prices*, Available at: <https://www.indexmundi.com/commodities/?commodity=natural-gas&months=360> [Accessed 13 February 2019]

International Monetary Fund (2018b). *Primary Commodity Prices Database*, Available at: <http://data.imf.org/?sk=471DDDF8-D8A7-499A-81BA-5B332C01F8B9>

International Monetary Fund (2018c). *The Diversification Toolkit: Export Diversification and Quality Databases*, Available at: <https://www.imf.org/external/np/res/dfidimf/diversification.htm>. [Accessed 8 May 2019]

International Monetary Fund (2019). *Investment and capital stock dataset*. Available at: <https://data.imf.org/?sk=1CE8A55F-CFA7-4BC0-BCE2-256EE65AC0E4>. [accessed 7 August 2019].

Ministry of Plantation Industries and Commodities-MPIC (2018) *Commodity Dataset*, Available at: <https://mpic.gov.my/mpic/index.php/en/statistic-on-commodity/dataset> [Accessed August 26 2018]

Natural Resource Holdings (2013) *Global Gold Mines & Deposits 2013 Ranking*. Available at: <http://2oqz471sa19h3vbwa53m33yj-wpengine.netdna-ssl.com/wp-content/uploads/2013/11/global-gold-mine-and-deposit-rankings-2013.pdf> [Accessed 17 February 2019]

OnlyGold (2018) *Historical Gold Prices: Over 200 years of historical annual Gold Prices*. Available at: <http://onlygold.com/Info/Historical-Gold-Prices.asp> [Accessed 19 February 2019]

OECD (2018b). *OECD Trade in Value-Added database (TiVA)* Available at: <http://oe.cd/tiva> [Accessed 11 May 2019]

UN COMTRADE (2018). *International Trade Statistics Database*. Available at: <https://comtrade.un.org/> [accessed 23 August 2018].

UNCTAD (2018) “Standard International Trade Classification (SITC) Revision 3”, *UNCTADSTAT*, Available at: http://unctadstat.unctad.org/EN/Classifications/DimSicRev3Products_Official_Hierarchy.pdf [accessed 15 August 2018].

World Bank (2019) *World Development Indicators*. Available at: <https://data.worldbank.org> [accessed 23 August 2018].

World Trade Organisation (2018) *Trade and Tariff data*. Available at: https://www.wto.org/english/res_e/statistics_e/statistics_e.htm [accessed 23 August 2018].

APPENDIX A:

Scoring Criteria Underlying the MINDEX

Table A1: Overall selected country data.

Country	Year	Extractives exports	Government extractives revenues	Extractives in government revenues	Extractives rents	Extractive reserves	Extractives in total exports
Chile	2010	0.7	0.6	0.2	0.7	0.7	0.5
	1997	0.4	0.3	0	0.4	0.7	0.5
	2016	0.6	0.4	0	0.7	0.7	0.5
Malaysia	1997	0.3	0.4	0.1	0.3	0.6	0.1
	2010	0.6	0.6	0.5	0.5	0.6	0.2
	2016	0.6	0.6	0.2	0.3	0.6	0.2
Algeria	1997	0.3	0.6	0.6	0.3	0.7	1
	2010	0.6	0.7	0.6	0.6	0.7	1
	2016	0.4	0.6	0.6	0.6	0.7	1
Iran	2010	0.6	0.7	0.5	0.7	1	0.9
	2016	0.3	0.6	0.3	0.6	1	0.8
Singapore	2010	1	0	0	0	0	0.3
Norway	1997	0.9	1	0.2	0.7	1	0.6
	2010	1	1	0.3	1	1	0.7
	2016	1	1	0.2	0.9	1	0.6
DRC	2010	0.1	0	0.1	0.1	0.8	0.9
	2014	0.1	0.1	0.3	0.2	0.8	1
Burkina Faso	2010	0.1	0.1	0.1	0.1	0.3	0.6
	2016	0.1	0.1	0.2	0.2	0.3	0.8
Chad	2010	0.3	0.3	0.8	0.3	0.5	0.9
Mali	2010	0.2	0.1	0.2	0.2	0.3	0.8

Table A2: Country Measurements for the MINDEX (Chapter 3).

<i>Table A2a: Chile</i>								
<i>Indicators</i>	<i>1990</i>		<i>1997</i>		<i>2010</i>		<i>2016</i>	
	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>
Mineral reserves (USD)*	687 bil.	0.8	687 bil.	0.8	687 bil.	0.8	687 bil.	0.8
Mineral reserves (USD per capita)	51880	0.8	46751	0.7	40428	0.7	38359	0.7
Mineral rents (USD per capita)	250	0.4	353	0.4	2248	0.7	1375	0.7
Mineral exports (USD per capita)	n/a	n/a	557	0.4	2745	0.7	1768	0.6
Share of minerals in exports	51%	0.5	52%	0.5	50%	0.5	53,2	0.5
Government resource revenues (USD per capita)	n/a	n/a	113	0.3	563	0.6	178	0.4
Resource revenues in government revenues(%)**	Around 20%	0.2	>5%	0.0	20%	0.2	1.7%	0.0

*Chile holds 170 million metric tons of copper reserves and 8.4 million tons of lithium reserves. Source: U.S. Geological Survey (2019)

** Source: AfDB (2017); Fuentes (2010) and Gallagher and Porzecanski (2010).

<i>Table A2b: Norway</i>						
<i>Indicators</i>	<i>1997</i>		<i>2010</i>		<i>2016</i>	
	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>
Mineral reserves in USD*	559 bil.	0.8	559 bil.	0.8	559 bil.	0.8
Mineral reserves in USD per capita	126897	1	114332	1.	106791	1.
Mineral rents (USD per capita)	2221	0.7	6971	1.	4088	0.9
Mineral exports (USD per capita)	6,662	0.9	18,665	1	10,080	1
Share of minerals in exports	64%	0.6	70%	0.7	61.6%	0.6
Government resource revenues (constant USD per capita)	5391	1	9,887	1	3770	1
Resource revenues in government revenues (%) **	18%	0.2	27%	0.3	11%	0.2

*Norway holds crude oil reserves of 6,611,000,000 barrels (USD 308 billion) and natural gas reserves of 1,856 billion m3 (USD251 billion). Source: CIA (2018)

**Source: Norsk Petroleum (2018), Norwegian Petroleum Directorate (2010).

<i>Table A2c: Algeria</i>						
<i>Indicators</i>	<i>1997</i>		<i>2010</i>		<i>2016</i>	
	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>
Mineral reserves*	1.2 trillion	1	1.2 trillion	1	1.2 trillion	1
Mineral reserves in USD per capita	40151	0.7	33225	0.7	29552	0.7
Mineral rents (USD per capita)	179	0.3	886	0.6	527	0.6
Mineral exports (USD per capita)	453	0.3	1556	0.6	704	0.4
Share of minerals in exports	96%	1	97%	1.	95%	1.
Government resource revenues (constant USD per capita)	394	0.6	1081	0.7	493	0.6
Share of resource revenues in total government revenues. **	62% (1999)	0.6	60%	0.6	60-66%	0.6

*Algeria holds natural gas reserves of 4,504 billion m3 (USD608 billion) and crude oil reserves of 12,200 billion barrels (USD570 billion). Source: CIA (2018)

**Source: IMF (2000)

<i>Table A2d: Malaysia</i>								
<i>Indicators</i>	<i>1990</i>		<i>1997</i>		<i>2010</i>		<i>2016</i>	
	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>
Mineral reserves (USD)*	328 bil.	0.7	328 bil.	0.7	328 bil.	0.7	328 bil.	0.7
Mineral reserves in USD per capita	18184	0.6	15210	0.6	11667	0.6	10517	0.6
Mineral rents (USD per capita)	257	0.4	224	0.3	485	0.5	223	0.3
Mineral exports (USD per capita)	n/a	n/a	348.75	0.3	1267	0.6	1097	0.6
Share of minerals in exports	17%	0.2	13%	0.1	24%	0.2	19%	0.2
Government resource revenues (USD per capita)	283 (1992)	0.5	208	0.4	625	0.6	429	0.6
Resource revenues in government revenues **	9.4%	0.1	9.4%	0.1	45% (2012)	0.5	22%	0.2

*1183 billion m3 of natural gas reserves (valued at USD160 billion) and 3,6 billion barrels of crude oil reserves (valued at USD168 billion). Source: CIA (2018)

** Data for 1980, 1990 and 1997 are based on averaged data for the time periods 1980-85 and 1991-95 (see Wee Chong Hui, 2008)

<i>Table A2e: Singapore</i>		
<i>Indicators</i>	<i>Data (2010)</i>	<i>Score (2010)</i>
Mineral reserves	0	0
Mineral reserves in USD per capita	0	0
Mineral rents (USD per capita)	0	0
Mineral exports (USD per capita)	12,827 (5 th)	1.0
Share of minerals in exports	28%	0.3
Government resource revenues (USD per capita)	5.69	0
Share of government revenues in total revenues	0	0

<i>Table A2f: Democratic Republic of Congo (DRC)</i>				
<i>Indicators</i>	<i>2010</i>		<i>2014</i>	
	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>
Mineral reserves (in USD)*	>3,4 trillion	1	>3,4 trillion	1.
Mineral reserves in USD per capita	52694	0.8	46119*	0.8
Mineral rents (in USD per capita)	49	0.1	95	0.2
Mineral exports (in USD per capita)	72	0.1	55 (2016)	0.1
Share of minerals in exports	91%	0.9	97%	1.0
Government resource revenues (USD per capita): source EITI (2019)	USD13	0.0	USD25	0.1
Government resource revenues (USD per capita): source: ICTD	7	0.0	5	0.0
Share of government revenues in total revenues**	12%	0.1	25%	0.3

*We have reasons to believe that the value of DRC's mineral reserves is much higher, because of limited exploration to date. The most important minerals for the DRC are cobalt, copper, and diamonds, but the country also produces some gold, tin, iron, nickel, and tantalum, amongst others, which I have not included in the measurement. According to some sources, the DRC has over USD24 trillion in mineral deposits (Migiro, 2018; Mining in Africa, 2018; Morgan, 2009). However, this number may be exaggerated. According to my own calculations and methodology (averaging prices for the period 1990-2016), DRC's diamond reserves (around 150 million carats) represent a value of USD 3.165 trillion. DRC's cobalt reserves are valued at USD153 billion, while its copper reserves (of around 20 million metric tons) are valued at around USD80 billion. DRC's lithium reserves (1 million tons according to estimates from the United States Geological Survey) are valued at around USD5 billion.

** Sources: Anyanzwa (2017)

<i>Table A2g: Burkina Faso</i>				
<i>Indicators</i>	<i>2010</i>		<i>2016</i>	
	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>
Mineral reserves* (in USD)	29 billion	0.4	29 billion	0.4
Mineral reserves in USD per capita	1858	0.3	1555	0.3
Mineral rents (USD per capita)	42	0.1	55 (2015)	0.2
Mineral exports (USD per capita)	57	0.1	89	0.1
Share of minerals in exports	61.5%	0.6	76,6%	0.8
Government resource revenues (USD per capita)	USD21 (2012)	0.1	USD 14	0.1
Share of resource revenues in total government revenues. **	Between 5% and 16%	0.1	15.9% (2015)	0.2

* Only gold reserves have been measured and valued in this table. Burkina Faso holds around 1,23% of world gold reserves, equivalent to around 45,746,412 ounce of gold (author's calculations using data from Natural Resource Holdings, 2013)

** See EITI (2013, 2016, 2018)

<i>Table A2h: Chad</i>		
<i>Indicators</i>	<i>Data (2010)</i>	<i>Score (2010)</i>
Mineral reserves*	USD 70 billion	0.5
Mineral reserves in USD per capita	5889	0.5
Mineral rents (USD per capita)	186	0.3
Mineral exports (USD per capita)	USD 315	0.3
Share of minerals in exports	93%	0.9
Government resource revenues (USD per capita)	114.5	0.3
Share of resource revenues in total gov revenues. **	75% (IMF)	0.75

*Source: CIA (2018)

** Source (IMF, 2016)

<i>Table A2i: Mali</i>		
<i>Indicators</i>	<i>Data (2010)</i>	<i>Score (2010)</i>
Mineral reserves*	19 billion	0.3
Mineral reserves in USD per capita	1260	0.3
Mineral rents (in USD per capita)	68	0.2
Mineral exports (in USD per capita)	107	0.2
Share of minerals in exports	77%	0.8
Government resource revenues (USD per capita)	15 (2013)	0.1
Share of resource revenues in total gov revenues**	17.6 (2007)	0.2

* Only comprised of gold and zinc. Mali holds around 800 metric tons of gold reserves equivalent to 25,720,597 ounces and 1,7 million metric tons of zinc reserves. Source: EITI (2018b)

** EITI (2018b)

<i>Table A2j: Iran</i>				
<i>Indicators</i>	<i>2010</i>		<i>2016</i>	
	<i>Data</i>	<i>Score</i>	<i>Data</i>	<i>Score</i>
Mineral reserves*	11 trillion	1	11 trillion	1
Mineral reserves in USD per capita	147517	1	137025	1
Mineral rents (USD per capita)	1416	0.7	832	0.6
Mineral exports (USD per capita)	1011	0.6	404	0.3
Share of minerals in exports	87%	0.9	79,3%	0.8
Government resource revenues (constant USD per capita)	831	0.7	391	0.6
Share of resource revenues in total government revenues**	50-60%	0.5	34%	0.3

*Iran holds 33,500 billion m3 of natural gas reserves (valued at USD 4,523 billion) and 158,4 billion barrels of crude oil reserves (valued at 7,080 billion USD). Source: CIA (2018)

**See Farzanegan (2011) and Financial Tribune (2018).

APPENDIX B:

Historical Phases of Industrial Policy in Malaysia

It is difficult to distinguish clear phases of industrialization in Malaysia due to the heterogeneous industrial strategy and policy across sectors (some sectors were guided by an ISI strategy while others were guided by an EOI strategy). However, four broad phases of industrialization can be reasonably distinguished, as done in Alavi (1996), Gopal (2001), and Lall (1995), and as summarized in the following table.

Table B1: Industrial strategy and policy tools employed in Malaysia

Period	Industrial strategy	Some industrial policy tools	Emphasis
1957 - 1970	FDI-led ISI	Tariffs and fiscal incentives	Simple consumer goods
1970 - 1980	Export oriented industrialization (EOI) Free trade zones	Fiscal incentives and FDI promotion Investment Incentives Act (1968) Industrial Coordination Act (1975)	Manufacturing (electronics) Textile Bumiputra equity ownership and employment
1980 - 1985	ISI in heavy industries	Investments by SOEs Fiscal incentives and FDI promotion National Heavy Industry Policy National Industrialization policy Malaysia Incorporated Policy	Heavy industries Bumiputra equity ownership and employment
1985 - 2005	Export Promotion	Fiscal incentives and FDI promotion Industrial Master Plans 1 and 2 Promotion of investment Act (1986)	Bumiputra equity ownership and employment Resource-Based industries and manufacturing
2006 - 2020	Export Promotion	Fiscal incentives and FDI promotion Economic transformation Programme Industrial Master Plan 3	Resource-Based industries and High Tech activities Bumiputra employment

Source: Lall, 1995, Alavi (1996) and Gopal (2001)

APPENDIX C:

Categorization of some of Chile's Policy Interventions since 1973

Table C1: Categorization of some of Chile's Policy Interventions since 1973 ²⁶⁶

	Horizontal		Vertical	
Public goods provision			Regulatory and Quality control bodies for foodstuff	Servicio Agrícola Ganadero (SAG), Subpesca, Sernapesca, Chiquihue Foundation ²⁶⁷ , 'Mesa del Salmon'
Market intervention	SME credit & financing:	CORFO GIF windows, FOGAPE, SERCOTEC loan preparation programme, credit lines from BancoEstado	Public venture capitalism and entrepreneurship:	Fundación Chile, Codelco.
	Economies of scale & SME upgrading:	CORFO's programmes such as the supplier development programme (PDP), entrepreneurial management programme, FONTEC, PROFO, FAT, FOCAL.	Targeted subsidies	Decreto Ley 701, reimbursing 75% of the cost of reforestation and Decreto Ley 2565 increasing the subsidy to 90% (1979). Central Bank's subsidized credits for forestry sector. CORFO FDI subsidies for ICT sectors.
			Sector-specific education:	Chile-California programme
	Export subsidies:	<i>Reintegro simplificado</i> (discontinued 2003)	Technology transfer and sectoral research on investment opportunities	The Salmon Technology Institute, SERNAP, IFOP (Fisheries Development Institute), Institute of Agricultural Research (INIA), the Forestry Institute; the Fishing Development Plan; the Institute for Geological Research; National Mining and Geological Service; and the Natural Resources Research Institute (IREN), Cochilco, Programme of Science and Technology (PCT)
	Training & technical assistance:	National Training and Employment Service (SENCE, 1976), National Training Fund (1998), CONICYT		
	Generic export promotion:	ProChile (1975), SERCOTEC (1982) and negotiation of FTAs		
	R&D subsidies:	CORFO Innova	Agricultural protection:	Higher tariffs for four groups of products with price bands
	Investment subsidies	Central Bank's Debt Equity Swaps programme		

Source: Author's update of an existing table in Agosin, Larrain and Grau (2010), using data provided by Bravo-Ortega and Eterovic (2015), Meller and Zenteno (2013), and information contained in chapter 8.

²⁶⁶ The policy instruments examined here mostly relate to market interventions, while horizontal public goods provision have not been the core focus of this thesis.

²⁶⁷ Chiquihue Foundation set up by the regional government of Los Lagos, aims to improve the capacity of artisanal fishing communities within the Los Lagos Region.

APPENDIX D:

Data used for the difference-in-difference policy evaluation method in chapter 9

Table D1: Data on the fruit and vegetable exports of Chile (1964-2017)

Export Value (in USD 1000)	Products	1964	1969	1974	1979	1994	1999	2009	2017
	<i>Vegetable Products*</i>	12503	8118	32099	83053	321629	397961	608720	762989
	<i>Fruits**</i>	13254	15159	36953	210445	1519098	2086220	3686767	5747827
Annual Growth Rate (%)	Products	1964-1974		1974-1999			1974-2017		
	<i>Vegetable Products</i>	10.0%		10.6%			7.6%		
	<i>Fruits</i>	10.8%		17.5%			12.5%		

* Vegetable products were identified and grouped using the STIC codes 54, 56 and 292.

** Fruit products were identified and grouped using the STIC codes 57 and 58.

Sources: Center for International Data (2018) and UN Comtrade (2018)

Table D2: Data on fish exports of Chile (1963-2016)

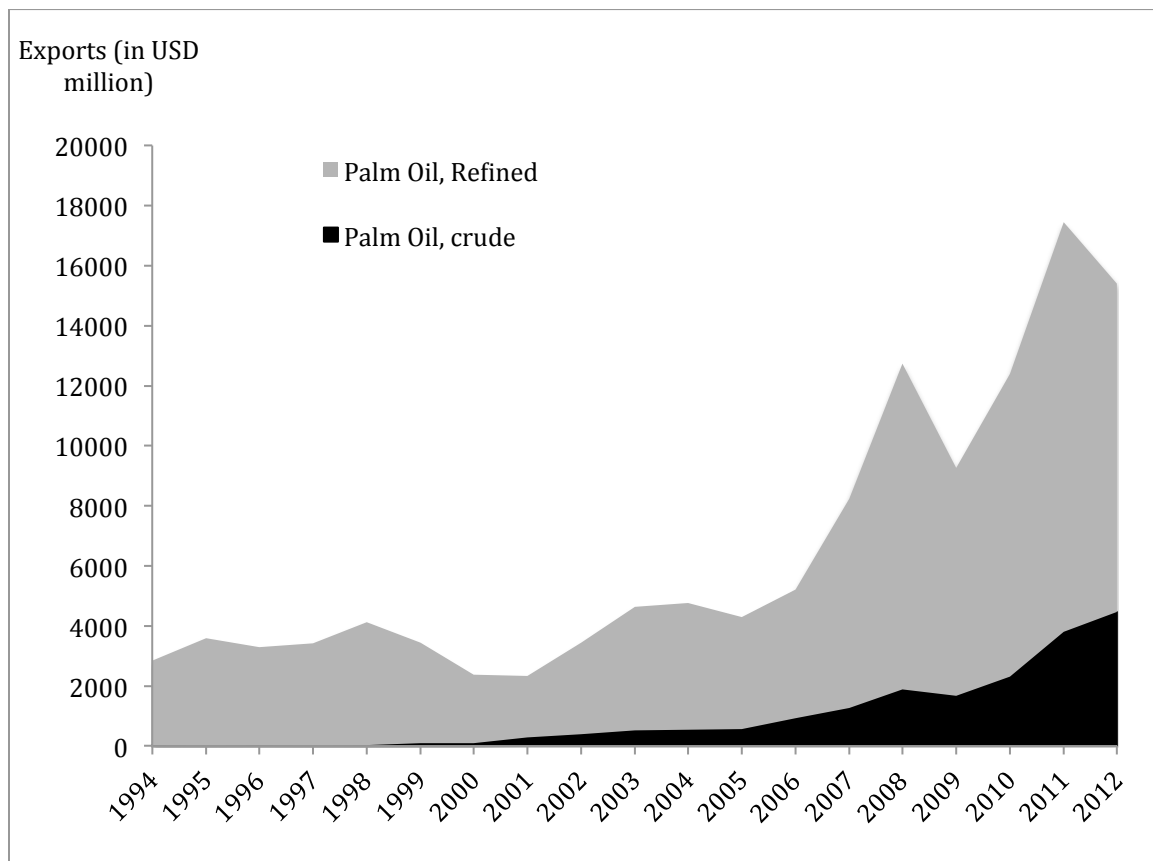
Export Value (in USD million)	Products	1963	1969	1986	1989	1993	1998	2003	2007	2013	2016
	<i>Salmonids</i>	0	0	5	50	291	714	1147	2243	3517	3844
	<i>Non salmonids</i>	15	33.1	385	693	698	856	1013	1697	1473	1246
	<i>Total fishery exports</i>	15	33.1	390	743	989	1570	2160	3940	4990	5090
Annual Growth Rate (%)	Products	1969-2016			1969-1986			1986-2016			
	<i>Non salmonids</i>	7.1%			15.5%			4.0%			
	<i>Salmonids</i>	N/A			N/A			24.8%			

Sources: Author's calculations based on compiled data from SalmonChile's databases (2009, 2018), UNCTAD (2006b), Achurra (1995), Center for International Data (2018), UN Comtrade (2018).

APPENDIX E

Palm oil exports in Malaysia after 1994

Table E1: Malaysia's palm oil exports between 1994 and 2012



Source: Author's elaboration based on data in UN Comtrade (2018)